PERSONAL COMPUTER NEWS

EVERY THURSDAY

45p SEPTEMBER 22-28 Vol 1 No 29

THE COMPLETE COMPUTING WEEKLY



THIS WEEK

TI PROGRAMMING
Make your programs put themselves in order

DRAGON DRIVES
Exclusive Pro-Test of the new disk system

APPLE ETCHINGS
The lighter side of graphics with Gibson's light pen

ORIC OVATION
Six new games get the PCN Play-Test

EVERY WEEK

PCN CHARTS
Trace the ups and downs of the top sellers

MICROPAEDIA
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PORTICO'S MIRACLE
PRO-TEST OF THE NEW PORTABLE

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WIN AN ELECTRON!
See page 58 for details

MENU

September 22-September 28, 1983 Volume 1 No 29

The price of quality

Next week we'll be asking you to pay an extra 5p for *PCN*. Unfortunately we just cannot continue to provide this magazine for under 50p. No other magazine even attempts to produce something of this quality for so little, and when it came to a decision between lopping pages of *PCN* or upping the price by a few pence, the latter won the day.

You won't find anything of *PCN*'s quality (and quantity) for less. But then you wouldn't be reading this if you hadn't already noticed this vital difference. And for this reason I hope you'll stick with us.



Pull-out and keep

Micropaedia Dragon: Part 3

REGULARS

Cover photo by Michael Dunning

PCN SPECIALS

PCN PRO-TEST: HARDWARE



PCN PRO-TEST: SOFTWARE

PCN PRO-TEST: PERIPHERALS





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BBC airs its software

The long-awaited BBC Telesoftware service was due to get off the ground this week.

Scheduled for an official launch on Tuesday, the system will beam software across the airwaves to be picked up on Ceefax or adapted television sets and loaded into BBC micros.

The BBC has called it the world's first telesoftware service, but that was back in the heady days of March when it was planned to start in May. First or not, it is an ambitious plan to broaden the horizons of home computer users up and down the country by giving them access to the kind of software that they may not otherwise have used (*PCN, Issue 3*).

If you already have a Ceefax set the software will be free — coming in through the window, in a manner of speaking. If you don't, you'll need a teletext adaptor, planned to sell for £225, and it has been the supply of these units from Acorn that is thought to have held up the service.

The bulk of the software — probably two-thirds — will be educational and the rest will be 'general interest', mainly utilities. About 150K's worth will be broadcast in fortnightly cycles, according to the BBC's original plans for the service. Much of it will come from the BBC's own microelectronics series and from a project that involved the BBC, the IBA, and the electronics company Mullard. Some educational software is expected to be commissioned in the future as the service develops.

■ Next week we'll have a full report on the BBC's proposals.

Big names in the late, late show

The teletext adaptors are just the latest in a long line of embarrassing delays for Acorn. The saga of the second processors for the BBC, for example, is still dragging on. But Acorn is far from being the only micro company having trouble delivering the goods. Here is a short round-up:

Acorn — Z80 and 6502 second processors for the BBC are now more than a year overdue. The last deadline they missed was August. Acorn now suggests November or the new year, but whether it means one or other or both of the processors is not clear. Acorn's cartridge software was due in June

Camputers — A 96K Lynx with disk drives and CP/M should have been launched this spring. The 96K model has appeared recently, but no CP/M or disks.

Torch — The Torch 700 was proclaimed with Unix available on the 86000 card in July. Unix is proving difficult.

Advance — Advance's 86 IBM-compatible portable system was due in June/July.

Flat racers

Sinclair's new flat-screen technology, unveiled in the form of a pocket TV last Friday, is unlikely to be used in its upcoming small business micro.

Although Sir Clive Sinclair hinted that the flat screen technology could be used with a micro, the timing of his hint suggests that it could not possibly be used in the business machine planned for launch in early 1984.

But the flat-screen will still figure in Sinclair's computing plans. 'The flat screen tube is very much in our plans for the computer market,' Sir Clive said. 'But realistically we're over a year away from using the flat screen in portable computers.'

And a Sinclair spokesman confirmed that the ZX83 will not use the flat screen. But he did say that the ZX83 will use the Microdrives recently introduced for the Spectrum and that the business machine will use a non-standard operating system of Sinclair's own design.

He added that Sinclair will be very careful about the timing and nature of the launch in recognition of the fact that until now it has not been known for building business machines.

Sir Clive's comment on the appearance of a portable with a flat screen a year from now also suggests that the ZX83 will not be a portable.



Sinclair's flat-screen TV uses a single integrated circuit chip to perform the majority of signal processing functions. The £79.95 2in TV is the first television to have all such functions controlled by a single chip.



CRAFTY — Word processing software that has been making headway with Commodore owners will soon be hot on the heels of that old warhorse, Wordstar, according to Wordcraft Designs of Derby. Wordcraft has produced versions of its package for leading 16-bit machines such as Sirius 1, the IBM PC, and the IBM PC-XT. The 16-bit versions of Wordcraft are designed to use all of the keyboard functions available on the computers concerned. For instance, the Sirius version has multiple screen menus for the machine's function keys and makes full use of the character set. Each package costs £488 and distribution is by Dataview on Colchester (0206) 869414.

TI threat to 99/4A cartridges

By Chris Cunningham

Owners of Texas home computers are about to gain a second supplier of software cartridges for their machines. But from Texas Instruments' point of view, there may be doubt about how long Audiogenic of Reading and its American supplier can continue selling cartridges.

Texas has licensed only one company other than itself to produce software cartridges for the 99/4A computer — Funware of Richardson, Texas. Funware supplies cartridges to its Californian parent company, Creative Software, and Creative in turn will send cartridges to Audiogenic for distribution in Britain.

However, neither Creative Software nor Audiogenic is a party to the agreement with Texas. If the cartridges are sold under any name other than Funware, Texas may sue.

Texas Instruments has had a monopoly on supplies of cartridges for the 99/4 since it introduced the computer in 1980. But the semiconductor giant decided to make an exception when, just a year ago, a group of its employees left to set up their own software company, Funware.

During the summer that agreement ran into complications. Creative Software bought a controlling interest in Funware, and Texas was faced with the possibility of a third name on its cartridges. That would risk the breach of an agreement so strict that under one of its clauses Funware cannot even admit the document exists.

At the Consumer Electronics Show in Chicago last June, Texas gave out veiled threats that it would sue any company producing software cartridges for the 99/4A and a modified version of the 99/4A appears on Texas's stand. According to Texas, the computer on display included circuitry for holding graphics software in a special memory store — a buffer — before it is fed into the computer's main memory. The computer has to do this because cartridges can hold up to 40K of memory in their graphics read-only memories (GROM), while the user memory amounts to just 16K.

A spokesman for Texas's consumer division at Lubbock, Texas, told *PCN* that extra circuitry for handling the buffering operation was included in the original design of the 99/4A.

That seems to be no problem for Funware; the company's head, Michael Brothers, marched up to the Texas stand, inserted one of his company's cartridges, and ran the program successfully.

Funware has been producing and selling cartridges for the 99/4A since the beginning of this year. A spokesman for the firm said: 'Lots of people were wondering why Texas didn't sue Funware after its announcement (the threat to sue) at Chicago. We are confident that they wouldn't sue.'

Audiogenic says it will distribute cartridges under Funware's label, 'perhaps with a sticky label saying "Distributed by Audiogenic".'

Autumn crop from Tandy

After the launch this summer of the Tandy Model 100 and Model 4 computers, you might think the company would take things easy for a while. In fact, it will launch four more new products in the next month.

Not only will the coming weeks see the arrival of the MC-10 colour computer (previewed in *PCN Monitor, issue 23*), but also the release of a new battery-powered acoustic modem for the Model 100 portable, a seven-colour ink-jet printer and a version of the PFS filing system program suite.

The cheapest of the new products is the PFS software suite, at £79.95. It is closely followed by the MC-10 priced at a Spectrum-bashing £99.95 (that's the base price for the machine). The modem will go for £279.95, some £200 less than the price of the printer, which tops the list at £499.

Each of the new products seems to have a good deal to recommend it. The British Telecom-approved 300-baud modem, for instance, operates on nickel cadmium batteries and allows the Model 10 to access services such as Telecom Gold down the phone line. The modem can be used with any other Tandy computers but with the Model 100 it is even more atractive as it gives you an entirely portable phone computer terminal. The modem weighs only 20oz and is 10in long, 3½in wide and 2½ deep.

The ink-jet printer also looks set to break new ground, with capacity to print seven RGB compatible colours at the rate of 2,300 dots per second. The technique is accomplished with three colour ink jets, which mix to provide the other four.

Osborne crash

The Osborne Computer Corporation's crash has left UK users wondering whether they're left high and dry. Osborne UK says no, but the user group isn't so sure.

Last week the company declared itself bankrupt, but there's still hope it may be salvaged because it has filed for protection under chapter 11 of the US Bankruptcy Code. Chapter 11 allows the company to continue operating with court protection from creditors, while it tries to work out its problems.

This breathing space will give Osborne the chance to find a possible buyer to take over the company and strengthen its finances. Until then, development of an IBM-compatible machine will continue.

The plight of Osborne came as a shock to the American industry, but the shutdown follows a severe decline in sales of Osborne's personal computers. This could be the beginning of the long anticipated shake-out of business computers. In the UK Grundy and Dragon have already felt the tremors of what could be an eruption in the home computer market.

Observers in the computer field have mixed reactions to Osborne's fate. But undoubtedly it's felt that Adam Osborne took too long to announce the successor to the Osborne 1, giving other companies a chance to slip in and take a bite of the market.

Mike Healy, of Osborne UK, said: 'Our operations in the UK are a separate entity from that in the States. We will still continue to trade as we have secure stocks and there's still a lot of demand for the Osborne 1.

'As far as we are concerned the Osborne 1 is the only portable in large supply. Kaypro and Compaq, which have hit sales of Osborne computers in the States, have no effect here.

'It's only a question of time before the problems they've created for themselves will come round to haunt them — at which point we don't expect them to be around any more.'

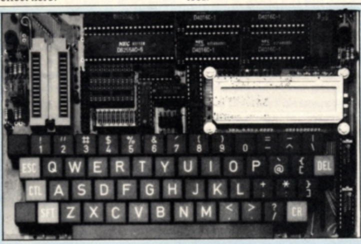
Prophetic Adam Osborne? No, he was talking about Kaypro in this July interview.

'Kaypro and Compaq portables are not readily available yet.'

Although Osborne UK doesn't seem to be too disturbed by events, the British Owners Group feels less secure about the situation. John Anglesea of the group: 'Of course we feel very sad. But now we see ourselves as the only support for the Osborne 1.

'People that are worried and feel that they've been left in the lurch can come to us. We will be able to act as a substitute for Osborne but we can't do anything about guarantees.'

ALL-IN-ONE — This trim little board harbours a Z80 with all the peripheral elements you'll need to build a compact system. It comes from Microcomputertechnik in Wuppertal, West Germany, and costs $385. Besides the Z80 and a full ASCII keyboard it has a 16 character LCD display, up to 40K of CMOS RAM, up to 48K of EPROM, one IEEE and two V24 interfaces. A monitor program is also included in the price. The supplier can be contacted on 010-49-202 510444. The system, called the MMC-6, also includes the option of an EPROM programmer which can be built in. This will handle 2716, 2732, 2732A, and 2764 chips. Without it the MMC-6 costs $350.



Santa and the sick micros

As Christmas nears, home computer makers are looking forward to a bumper season. But how many of the thousands of machines sold this Christmas will have to be returned because of faults?

PCN asked the manufacturers of home computers how many of their machines (as a proportion of current output) found their way back during the warranty period to be repaired, and whether they could put their fingers on a main source of trouble.

Some of them preferred not to comment; Texas Instruments said that it was well pleased with the reliability of its systems, and Atari pointed out that it had a substantial network of support if anything did go wrong with a new machine. The accompanying table gives the results.

There is no independent way to check these figures, and most of the manufacturers seemed pleased with their performance. But the view from the High Street is slightly different in several respects.

Ian Williams, of Dixons, said: 'Our impression is that it (the rate of returns) is not acceptable yet, but it is improving. Some manufacturers are worse than others.'

Backing up Sinclair's point he added: 'There is also a problem of consumer understanding. We carried out a test of our own and found that about 15 per cent of the machines coming back weren't actually faulty.'

He acknowledged that the retailers bore some responsibility in this respect, and said that they too were improving. But as far as the manufacturers are concerned, there is no simple rule of thumb that might help you pick an immediately reliable system: 'It is not necessarily dependent on the age of the manufacturer or the maturity of the machine,' said Mr Williams. 'Sometimes it varies according to such factors as where they are buying their components.'

On one point he was categorical: 'People have got to get used to micros — making them, selling them, and using them.'

Some manufacturers are not included in the list. Mattel, for example, has only recently launched the Aquarius, and similarly Sharp with the MZ700. Future issues of *PCN* will update the table to look at their performance.

Manufacturer	Percentage Returns	Dominant fault
Acorn	under 5	
Apple	0.8	
Atari	—	
Camputers	originally 5.2, now under 5	
Commodore	under 1	Knocks sustained in transit
Dragon	—	
Jupiter	5	Power supply
Lowe	7.1	Pressure on piggy-back board
Oric	—	
Sinclair	5	More than 50 per cent of systems returned are said not to be faulty
Tandy	3	Some attributable to mis-use
Texas Instruments	—	

VIEW FROM JAPAN



Japan Inc tools up in English

by Serge Powell

Not so long ago a leading Japanese personal computer magazine ran an article on the best-selling business software packages to be found in Tokyo's top ten computer stores.

Not surprisingly, Japanese word processing packages were far and away the winners, although there was no clear-cut champion, since the programs tend to be exclusive to the disk operating systems of each hardware manufacturer. The popularity of WordStar was particularly surprising, in spite of the fact that many of the units are built around a Z80 or Z80 equivalent processor. But in Tokyo an incredible amount of material is generated in English, this being the principal language used by Japan Inc in its communications with the rest of the world.

This adds up to a staggering pile of service manuals, owners' guides, and advertising material, not to mention trade and financial correspondence. But WordStar was not alone; dBase II is also popular. Ashton Tate's package turned up not only in the august company of this list but also in a survey of the best-selling CP/M packages — lo and behold, it led the field, and thereby hangs a tale.

According to Bill Smale, general manager of a major Japanese software house called JSE International, which distributes dBase II in east Asia, the dBase II sold in Japan is not exactly the dBase II sold elsewhere. Like other foreign products that succeed here it has been modified to accept Japanese Kanji in addition to the Roman letters and Arabic numerals it normally deals with. This is accomplished by giving it the capability of addressing the Kanji ROM in personal computers with a Japanese word processor, and it adds less than $100 to the cost of the program.

At its simplest level this means that companies that generate lists in Japanese or English — Ford Japan, for example, with its part numbers, prices and so forth — need to make the numerical entry once only, allowing an appropriate number of fields for descriptions in both languages so that either can be printed out as required.

When you consider that it is also possible to provide for such factors as currency conversion, the popularity of dBase II here really begins to make sense. At a more significant level it means that custom-software programmers in Japan have a powerful tool, thanks to dBase II's applications development capabilities. Also that CP/M, which until fairly recently had not made much of an impact in Japan, will find growing popularity among consumers and programmers alike — in fact, running against the tide of exclusivity, Japanese language-based word processors have recently started to appear for CP/M systems, and they are beginning to enjoy the kind of popularity more usually associated with general WP systems in the west.

It isn't difficult to extrapolate from that particular point. DBase II wouldn't win any prizes for the World's Easiest To Use Software, but here it is, ahead of the field in Japan, and performing usefully in more than one language. Some of its detractors — Ashton Tait's detractors, perhaps — say that it is inscrutable enough in English. Think how well a truly user-friendly piece of software might perform. Japanese eyes would pop out of Japanese heads up and down the country.

There could be an opening for English software producers in this, especially for anybody producing high-quality CP/M-based business software, if the programs are amenable to handle Kanji. For that matter anyone writing for MSDOS (PCDOS will mean very little here; the IBM 5550 has seen to that) or CP/M86 should find a greater potential market for their products.

In this regard JSE International's Mr Smale has offered to evaluate software that his company feels would be appropriate to this market. Among the specifics, he mentions that vertically integrated routines don't do well here, while database and file managers, calculating packages and the like should go down well.

JSE International's address is 9F Toyo Buildings, 6-12-20 Jingumae, Shivuya-Ku, Tokyo 150.

Cifer's trump

By David Guest

The race to implement Unix on a British-built micro has been won by Cifer. The Wiltshire-based firm began shipping Unix on 68000 cards in July to test sites and geared up for commercial deliveries at the start of this week.

Cifer announced its implementation of Unix in May, a month after the launch of its flagship Club business micro. The Club — or for that matter Cifer's 2880 series — can be upgraded to run Unix and Cifer has put together a support package to back up the operating system.

'We are very aware that you can't just offer a Unix machine,' said Cifer's Peter Readman. He added that 40 per cent of the effort of producing the Unix system had gone into finding software (compilers, database management systems, word processors and some applications) to run on it. 'There's a lot out there if you look in the right place,' he commented.

It has also instituted a software maintenance package and support in the form of manuals and training courses.

The Unix that Cifer is using is Unisoft's Uniplus, a full system 3.0 with some enhancements. The board is built around an 8MHz Motorola MC68000 with 256K of RAM and memory management routines. You can field-upgrade an 8-bit system or specify what hardware you want when you place an order.



Cifer's Club — letting Unix in.

A Cifer with an 800K floppy, a 10Mb hard disk, and the Unix/68000 card will cost close to £5,000.

If your requirements are more modest, the implementation of CP/M Plus on a Cifer system won't cost you any more than the original price of the machine. Cifer has just announced this as an advance on CP/M 2.2, which it has supplied as standard on the Club and other systems. CP/M Plus comes with additional user memory, Cifer utilities, and Digital Research's GSX-80 graphics package.

Nor is this the last of Cifer's activities for the time being. The company intends to launch a new machine at Compec later this year, and it is due to add Boss and the UCSD p-System to its O/Ss.

Cifer has a bread-and-butter business in terminals, and is anticipating a turnover of around £8.2 million for its latest financial year.

Seven Stars jogs Nascom

The days of slow assembling and lengthy lists of returned errors on Nascom computers may be over. Seven Stars Publishing of Camden, London, has introduced a version of the fast Z80-based assembler, Gener-80, for the machines.

Gener-80 handles source code at high speed and returns errors in code interactively. (The Nascom's assembler normally chews its way through whatever the user types in, then returns a list of error messages.) The full-screen editor included in the £9.95 package includes commands for creating source files and text-editing.

Gamesters put in plot mode

As if fighting off ranks of cosmic muggers wasn't enough, games hackers are now faced by the prospect of helping word-blind sci-fi authors through the last few pages of their novels, or (even worse) taking exercise.

Mosaic Publishing of Islington, London, will begin publishing packages of games programs books by the likes of sci-fi author Harry Harrison in the new year.

The games will follow scenes from the books and will give players the chance to decide the ending of a book. There are no points for addicts of the more violent space games who solve a mystery by killing off the whole cast of characters.

And when that novel approach to games software has drained a player's intellectual stamina, there is always a nice relaxing jog through the woods — an armchair-bound jog, that is. Phipps Associates of Ewell, Surrey has launched The Forest, an exercise in orienteering (a form of Scandinavian torture) for player and Spectrum. The game leads the player along scenic paths and offers hazards such as falling in the lake. It gives a new meaning to the command RUN.



Up hill and down dale with a Spectrum.

Phipps is on 01-393 0283.

Crackdown on piracy

Are you the sort of person who buys a software package, then sends a copy whistling through a modem to your mate's micro? Well watch it. The combined might of Westminster and Brussels is ganging up to put a stop to your little game and every copy of the game you try to produce.

In short, the parliaments of Britain and the European Economic Community are turning their legislative minds towards a version of copyright law covering computer software. Although precedent in British courts weighs heavily against commercial bodies suspected of software piracy, the majority of copiers may well have a few years' grace waiting for a common policy on software copyright in the EEC. These things do not happen overnight.

But this week, the copyright committee of the British Computer Society will set in motion an attempt to introduce a private member's Bill to amend the current laws of copyright. The committee is presenting a draft Bill to the society's technical board.

If the document (and an explanatory memo) receives the board's approval, it will then pass to the Parliamentary Information Technology Committee (PITCOM), under the supervision of Lord Lloyd of Kilgarran. An MP may then take up the Bill — in effect, an amendment — for introduction to Parliament, perhaps in the next session.

Bob Hart, chairman of the BCS's copyright committee, told *PCN* 'We would like to amend the current Act to ensure that copyright would extend to software programs, making them alternative expressions of a literary work. We are hoping we can get an MP's support to put forward that type of amendment.'

The Copyright Act of 1956, Britain's own interpretation of the Berne Convention, is already a patchwork of amendments. But the BCS clearly believes it is time some formal legislation covered software. Mr Hart admits that there are some very fine arguments to be made in comparing programs to literature, and many parliamentary lawyers would like to see the whole Act redrawn.

Nonetheless, the High Court tends to make decisions in favour of the plaintiffs in cases of software piracy. But no actual judgment has yet been made. Instead, according to the Computer Retailers' Association, an 'Anton Pillar decision' has enabled a plaintiff in three cases to break into the defendant's premises and take away any possible incriminating evidence.

The impetus for the BCS's move came from a meeting of the World Intellectual Property Organisation and the United Nations Educational, Scientific and Cultural Organisation in Geneva last June. The eventual finding of the meeting set up to consider software copyright was that the problem should be couched in existing copyright law.

Some of the legal and technical experts looking at the problem for the European Commission in Brussels think this is a strange attitude.

One question arising might be: does translating a program from, say, Fortran to Cobol constitute the same problem as producing a pirate Spanish edition of an English novel?

At the moment, it does not.

Rair Basic

Digital Research's answer to Basic-86, Personal Basic, has found its way on to a UK-produced micro by courtesy of Rair.

Rair, the source of ICL's Personal Computer, will implement Personal Basic under CP/M86 and MP/M86 on its Business Computer. The software is written in BCPL and needs roughly 43K of memory.

Rair's Business Computer will have no trouble accommodating it, with its maximum 1Mb of memory and concurrent 8-bit and 16-bit processors. The company says that this choice will suit the Personal Basic package, with its emphasis on program development.

One of the UK's best-established micro makers, Rair has been going through changes recently that have brought a fresh injection of capital, a strengthening of its dealer network, and the hiving off of its terminal business.

RTS Technology has been formed to take on the terminals, which at the moment include products from suppliers like Centronics, Qume, IBM, Texas Instruments and Hazeltine. The company's managing director Robert Mountain said that RTS intends eventually to sell complete systems. not necessarily built by Rair.



RTS managing director Bob Mountain.

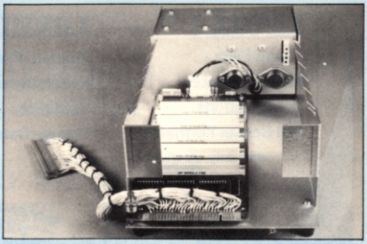
Mattel drops price of RAM

Aquarius users who couldn't afford to buy the 16K RAM expansion unit can now pick one up from Mattel for £29.95.

Originally the RAMpack was selling at £49.95 but considering that the Aquarius costs £79.95 the add-on seemed a bit expensive. Michael Lunch of Mattel said: 'We did a test market and found that compared to other expansion units ours was expensive — so we took £20 off.'

With only 4K of RAM in the basic machine the system can be expanded to a possible 52K to write bigger programs.

The RAMpack is available from High Street stores and through some mail order catalogues.



COLD FRAME — This is the MukBus Card Frame System that might encourage your Spectrum to grow up. At £59.95 the unit plugs onto the Spectrum's edge-connector and fully buffers the signal lines onto a six-slot motherboard. At the moment the unit as it stands doesn't do much, but by November there should be a range of printed circuit cards, including floppy disk, RS232/Centronics, 80-column video, 64K page-mapped memory and bar-code reader interfaces. A power supply is also available at £59.95. Contact Microtext UK, 0582-418894.

Compushack trio in UK

Another three IBM compatibles have made it to the UK just in time to catch the bandwagon.

The machines are produced by the Tava Corporation, which owns the American retail chain Compushack. English systems house Paperlogic has beome the European end of the Compushack franchise and has brought the new machines with it.

The Tava desktop PC looks like an IBM and costs like an Apple. It is PC-compatible and comes without disk drives, but with 64K, a printer port and two serial ports for £999. Compushack estimates that a twin 320K disk system could be put together for around £1,500, though you would still have to buy operating software either from IBM (DOS 2 costs £51) or from Digital Research (CP/M86 is £42). It looks as if the dramatic price lead set up by the yet-to-be-delivered Advance 86 is already eroded.

The Tava portable is a less dramatic proposition — production models will weigh around 32lbs and cost £2,199. But you get a 256K system with twin 320K floppies, IBM graphics and a 10in screen. Compushack will supply the system with CP/M86 and a Basic, though Concurrent CP/M86 may be supplied by the time the system is actually available.

The third and as yet unseen system is a twin processor machine designed for networking. It is claimed to be IBM-compatible and the price has yet to be fixed. Availability of all three systems is not expected for the next two months. Compushack can be contacted on 01-935 0480.

■ Paperlogic took the opportunity at its IBM-compatible launch to announce a range of low-cost disk drives for the BBC micro. The drives come in a very complete package with cabling, casing, disk interface and Kenda Software's DMFS, plus a free disk as standard. The disk interface is claimed to be really easy to fit, the 11 chips necessary coming in a plug-in module rather than as separate chips.

Prices, including VAT, are: 100K — £239.95, 400K — £389.95 and twin 400K — £649.95. Paperlogic is on 01-935 0480.

Spring-loaded Elan

Elan Computers has launched its £200 wonder micro in the best British tradition. The machine beats all home computers (and many business machines) on paper but won't be available until April.

The Elan Enterprise starts off as a 64K, Z80-based micro in a stylish case with a full keyboard and built-in joystick. A series of custom chips provides dramatic abilities.

Graphics can be up to a resolution of 672 × 512 with 256 colours. Text can be displayed in various formats up to 84 columns by 56 lines. There are obvious practical limits imposed by memory size but the Elan will let you freely mix 'modes' on the screen. It is, in theory, possible to emulate the screens of all popular micros, although the Elan has no hardware sprite ability as standard.

Sound is provided with four voices over eight octaves in stereo. It is reproduced either through the TV or Walkman-style headphones. Full control of envelopes and volumes is, of course, available.

Standard interfaces are twin cassette ports, twin joystick ports, a printer port and serial port. The machine can drive either a TV or quality monitor and hi-fi. The serial interface also provides a network capability which will be based on a simple three-wire system.

The machine can be expanded up to 128K internally and allows ROM cartridges of up to 64K to be plugged in. Beyond that, you'll need a special expansion system nicknamed 'The Stack'. This allows you to expand RAM and ROM to 3.9Mb (shades of the Newbrain).

The Stack also allows you to connect the Elan's twin Sony microfloppy disk drives and any future add-ons that are produced. In the words of Elan, the system isn't 'future proof', it has 'obsolescence built out'.

But hardware is only half the story. Elan is a new company formed as an offshoot of UK software house Intelligent Software. The Elan is the first machine to be announced with a new ANSI standard Basic.

This is a full Basic with many additions to allow for structured and large programs. Elan's version has full support for all the hardware goodies. The machine also has a 'word processor' in its ROM.

In short, the Elan appears to be the sophisticated yet affordable product that people have been waiting for. As a micro, its spec is miles ahead of contemporary systems. But then, so is its delivery date. Elan is confident that there will be nothing to match it by April — 18 months have already been spent on development.



The Elan Enterprise 64 — looks good, but April is a long way away.

Failing funds force club to close doors

A software club set up to sell cut-price commercial packages to its members has run into financial difficulty and closed its doors.

The Microcomputer Software Club, which has been in operation for eight months, has 32,000 members on its books, but it has grown too big for its own good.

The club could only generate a small trading income. It wasn't making enough money to pay off the interest on funds loaned to set it up.

To get the club back on its feet would have needed £¼ million. A spokeswoman for the club said: 'Members who've sent money to the club to buy software will be given a refund. At the moment the process is slow.

'As far as we can see this side of our operations will be closed down indefinitely — but we're always hopeful.'

Business soft at Sharp end

Business users who own a Sharp 3541 and feel bogged down by figures could look at a package called Kumacount 1.

Primarily pitched at retail stores, the program has three main sections. The sales section can be used by sales staff for selling, receiving stock, recording takings and checking understocked items.

The management section aims to equip the retailer with everything he needs to know about his business, covering such items as immediate stock values and stocktaking, individual item sales data, and help with mark-up. The purchase part of the program covers stock purchases and expenses.

The package costs £454.25 and is available from Kuma Computers, 0628 71778.

Sirius maker hits problems

Severe cutbacks at Victor Technologies in the US will not affect British supplies of the Sirius, according to ACT, the computer's sole distributor in Britain. But Victor's staff reductions of over 40 per cent will probably force ACT to spread its choice of American distributing companies for its own Apricot computer early next year.

In the past month, Victor has shed about 1,200 jobs, following heavy losses earlier in the year. The Americans blame slack business in Europe during the summer for their recent performance. According to Roger Foster, ACT's managing director, 'Victor has expanded so fast it has developed too many overheads too quickly.'

Because of problems arising from Victor's unwieldy distribution network, ACT 'might look elsewhere' to handle some of the business for Apricot, the Birmingham firm's portable 16-bit computer.

The American launch of Apricot will take place at the end of November at the Comdex show in Las Vegas. Supplies to the American market will not be in full swing until January.

Mr Foster told *PCN* that by that time ACT could well be handling many of its sales through leading systems houses in the US.

WH Smith takes plunge into hardware

WH Smith has joined the ranks of the manufacturers with its own computer-compatible cassette recorder.

Selling at £39.95 the recorder, called the CPD-8300, works with any computer that loads and saves programs using standard microphone and earphone sockets. It can also be used for normal recording and play-back of pre-recorded cassette tapes.

The CPD-8300 is bigger than conventional cassette recorders and isn't battery operated. However, it offers little extras which the company says are more useful.

The Save and Load levels on the machine are adjustable and stabilised, and can both be controlled by the level set control to eliminate problems often experienced when Saving on cassette recorders with only automatic electronic level control.

A speaker function switch allows speaker control in off/monitor/sound Amp modes, and automatic isolation of Save and Load sockets to prevent hum loops.

The CPD-8300 comes with a year's guarantee and will be available in WH Smith shops from September 27.



WH Smith's first step in own-brand hardware, the CPD-8300.

Chips to shrink

PCN confidently predicts that the chips of the near future will be small squares of silicon, packaged in oblong pieces of plastic. But in an industry with no certainties greater than that, IBM releases a steady flow of experimental devices, some of which might just give a clue to future design in the semiconductor business.

One brainchild from IBM's sprawling research centres that is causing a stir (and, by the law of averages, might just lead to a commercial product) is a 512K RAM. That is, a volatile memory chip loaded with more than half a million cells for storing the 1s and 0 of machine code — the final form of your efforts in Basic, bugs allowing.

More interesting than the storage capacity of the new chip is the design technique that could pack more bits into less silicon — the constantly receding touchstone of integrated circuit designers.

On the face of it, IBM's half-megabit memory has advanced to nowhere; it has twice the surface area of a chip with half the storage capacity (a 256K RAM). However, a comparison between a prototype chip and a production device is not really fair. IBM says it has not yet started to scale down its new technology.

This technology is called 'plate pushing' and gets half of its name from one of the basic components of a memory cell.

Each bit in a memory is held in a 'one-device' cell. In fact, just to confuse matters, there are two devices in a cell — a transistor to amplify an electrical signal, and the electronic equivalent of a capacitor, a storer of charge.

A simple capacitor comprises two surfaces, or 'plates', of conducting material, separated by a poor conductor. Charge builds up on one plate until it is large enough to jump the non-conducive gap. When a capacitor in a memory cell discharges, it has to be refreshed so that a charge (to describe a binary 1, say) is more or less always present.

Problems arise in shrinking memory cells for two reasons. First, alpha particles from a chip's packaging material can zip through the silicon, leaving behind a trail of electrical charges that are comparable with the legitimate, programmed charges that describe bits of computer data.

The result can be a fouled-up program.

Second, a very small charge representing a bit might simply fail to register when a computer's processor searches for data.

The size of the charge in storage cells has to be high enough to make the 'soft errors' of alpha particles insignificant. IBM's engineers have done this by feeding a 'booster' charge to each memory cell. In effect, the boost gives the capacitor plates an extra push — at what cost in terms of extra power consumption IBM is loathe to say.

But the Americans say that the size of the charge registering a bit at the current geometrical limits of memory design is doubled in plate-pushing devices. That should give them leeway for the next round of memory-shrinking which is already under way.

Software prop for ZX81

The ZX81 may be on its last legs in the High Street but Sinclair is contiñuing to put out software for it.

The latest batch, for the Spectrum as well, includes arcade games, programming aids, a logic puzzle and — perhaps suggested by Sir Clive himself, as president of Mensa — a home IQ test.

Sinclair's managing director Nigel Searle has described software development as a high priority at Sinclair; but two of the new products should make a better programmer of you. Monitor & Disassembler translates machine code into assembly language instructions to let you examine the Basic ROM, and Zeus Assembler is designed to simplify machine code programming.

The IQ test is called Cattell, and it runs on the 48K Spectrum. The logic puzzle is Flippit, and the games are Chequered Flag and MotherShip — racing and time-warping respectively.

The cassette-based software costs from £4.95 to £12.95 and should be in the shops soon.



SOFT BEAR — The well-known star of TV and books, Paddington Bear, is moving into a new career in home computing. Collins has put together a series of packages that put Paddington adventures on the Spectrum. Each pack contains a Paddington storybook accompanied by a cassette containing five programs which will educate as well as entertain. A book with a set of programs costs £6.10 and the software runs on the 48K Spectrum. Written for four-to-eight-year-olds, the titles include Paddington's Shopping Mix-Up, Paddington's Early Visit, Paddington's Picture Problems and Paddington and the Disappearing Ink. The packages will be available from WH Smith from October 19.

Epson moves in printer price war

The price war seems to have caught up with peripherals — if you're shopping around for a dot matrix device, Epson has knocked 10 per cent off its range.

The company says it has been able to make these reductions because of improved production techniques. You can now pick up an MX-100 for £546.25, an RX-80 T at £320.85, an FX-80 at £503.70, an RX-80 FT at £366.85, and an FX-100 at £654.35.

Finger on the Triga

A new joystick called Triga Command has arrived from the US.

Designed with a pistol grip, it has a heavyweight base with three optional suction cups which the company says won't budge in the heat of the moment.

With the firing button placed on the front side of the grip handle, Triga Command offers many of the standard features of other joysticks.

The device comes with an interface and costs £21.49 for the Spectrum and £14.49 for the Vic 20, Commodore 64, Atari 400/800 and VCS. Contact Datel Electronics. 0782 273815.

Mobile micro from Sharp

The new Sharp portable computer — the PC5000 — will be making its first public appearance at the International Business Show in Birmingham next month.

The 16-bit machine has an 8088 processor, 128K of RAM expandable to 256K, liquid crystal display, a querty keyboard and MS-DOS operating system.

Weighing 11.02 lbs the PC5000 is pitched at business users who travel a lot, as it can be used on a plane, train or car powered by a rechargeable battery. Not only can it be used as a stand-alone machine, it can also be connected to a host computer.

Sharp says the micro should sell for about £1,500 and will be available early 1984. And in addition to its basic features other options include a 128K bubble memory, a printer and a modem or acoustic coupler which enables the user to gain access to data bases anywhere, renew programs and obtain current financial information.

Another new machine to be shown at the show is the MZ3541 business computer, which has full colour graphics, built-in floppy disk drives and an RS232 interface. The computer will be linked to the new seven colour ink jet printer and will come with Peachtree software.

M20 quad disk

Olivetti's marathon running M20 business system has been given new memory with the addition of quad-density disks.

Earlier versions of the M20 and 160K and 320K floppies and the option of an 11Mb hard disk. The new quad-density units offer 640K of unformatted storage.

Olivetti (01-785 6666) is incorporating the new drives in packaged configurations. A typical set-up, called the M20-Q, will include the machine and two quad-density drives, at a price of £3,214. With one 640K unit and the hard disk the M20-HQ clocks in at £5,284.

A new release of Olivetti's Professional Computer Operating System PCOS has been issued to support the drives and it will be supplied as standard on all M20 systems sold from now on. Any software written for the smaller systems will run under it, the company says, and several extra features come with it.

These include a graphics dump routine for the Olivetti PR2300 ink-jet printer and extra facilities in utility programs, plus an optional display of control characters to help you develop communications.

If you already run an M20 with the smaller floppies it won't be possible to upgrade to the quad-density units, but an Olivetti spokesman said it might be possible to persuade your dealer to offer you a trade-in deal.

PCN Charts

This top 30 games list is compiled from both independent and multiple sources across the nation. It reflects what's happening in high streets in the two weeks up to September 1 and, like the micro charts, does not take account of mail order sales. The micro charts this week show the number of machines sold in the two-week period ending one week before publication date, so they tell the story in the high street between September 1 and September 15.

GAMES

Top Thirty

			GAME TITLE	PUBLISHER	MACHINE	PRICE
▲	1	(4)	Horace and the Spiders	Psion	Spectrum	£5.95
▲	2	(10)	Penetrator	Melbourne	Spectrum	£6.95
▼	3	(1)	Manic Miner	Bug Byte	Spectrum	£6.00
▼	4	(2)	Jet-Pack	Ultimate	Spectrum	£5.50
▲	5	(6)	3D Tanx	DK Tronics	Spectrum	£5.50
▼	6	(3)	Flight	Psion	Spectrum	£5.95
►	7	(7)	Arcadia	Imagine	Vic 20	£5.50
▲	8	(10)	The King	Microdeal	Dragon	£8.00
▲	9	(11)	Gridrunner	Llamasoft	Vic 20	£8.50
▲	10	(14)	Kong	Ocean	Spectrum	£5.90
▲	11	(17)	Heathrow ATC	Hewson	Spectrum	£5.50
▲	12	(19)	Football Manager	Addictive	Spectrum	£5.95
►	13	(13)	Mad Martha	Mikrogen	Spectrum	£6.00
▲	14	(20)	Time Gate	Quicksilva	Spectrum	£6.95
▲	15	(—)	Spawn of Evil	DK Tronics	Spectrum	£5.50
▲	16	(—)	Wacky Waiters	Bug Byte	Spectrum	£6.00
▲	17	(26)	Harrier Attack	Martech	Oric	£5.95
▼	18	(5)	AH Diddums	Imagine	Spectrum	£5.50
▲	19	(30)	Nightflight	Hewson	Spectrum	£5.50
▲	20	(27)	Battle of Britain	Microsimulations	Spectrum	£5.50
▲	21	(29)	Zoom	Imagine	Spectrum	£5.50
▲	22	(28)	Matrix	Llamasoft	Vic 20	£8.50
▲	23	(—)	Pool	CDS	Spectrum	£5.50
▲	24	(—)	Dictator	DK Tronics	Spectrum	£5.50
▼	25	(23)	Monsters in Hell	Softek	Spectrum	£6.95
▲	26	(—)	Zip Zap	Imagine	Spectrum	£5.50
▼	27	(12)	Jumpin Jack	Imagine	Spectrum	£5.90
▼	28	(15)	Terror Daktil 4D	Melbourne	Spectrum	£5.95
▲	29	(—)	3D Combat	Artic	Spectrum	£5.95
▲	30	(—)	Frantic	Imagine	Vic 20	£5.50

PCN Charts

Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and, like the games, is updated every alternate week.

PCN Charts are compiled exclusively for us by MRIB (Computers), London, (01) 408 0250.

HARDWARE

Top Twenty up to £1,000

MODEL			PRICE	DISTRIBUTOR
►	1 (1)	Spectrum	£99	(SI)
▲	2 (4)	Vic 20	£140	(CO)
▼	3 (2)	BBC B	£399	(AC)
▲	4 (7)	CBM 64	£229	(CO)
▲	5 (9)	Texas TI/99	£140	(TI)
►	6 (6)	Oric	£99	(OR)
▼	7 (5)	ZX 81	£40	(SI)
►	8 (8)	Atari 800	£300	(AT)
▼	9 (3)	Dragon 32	£174	(DR)
►	10 (10)	Colour Genie	£168	(LO)
▼	11 (14)	Sharp MZ80A	£347	(SH)
►	12 (12)	Atari 400	£149	(AT)
▲	13 (16)	Lynx 48	£225	(CA)
▼	14 (11)	Tandy Colour	£240	(TA)
►	15 (15)	Apple IIe	£972	(AP)
▲	16 (17)	Epson HX20	£472	(EP)
▲	17 (18)	Aquarius	£79.95	(MA)
▲	18 (—)	CGL M5	£150	(SO)
▲	19 (—)	Nascom 3	£49	(LU)
▼	20 (19)	Sharp PC1500	£169	(SH)

Top Ten over £1,000

▲	1 (2)	IBM PC	£2,392	(IBM)
▼	2 (1)	Sirius 1	£2,525	(ACT)
▲	3 (7)	Epson QX10	£1,995	(EP)
►	4 (4)	DEC Rainbow	£2,714	(DEC)
▼	5 (3)	Apple III	£2,780	(AP)
▼	6 (5)	Commodore 8096	£1,374	(CO)
▲	7 (—)	British Micro Mimi 3	£1,490	(BM)
▲	8 (9)	Portico Miracle	£1,795	(PO)
▲	9 (—)	HP 86A	£1,541	(HP)
▼	10 (6)	Televideo TS802	£1,960	(MI)

AC Acorn Computers. **ACT** — ACT. **AP** — Apple Computer. **AT** — Atari International. **CA** — Camputers. **CGL** — Computer Games Ltd. **CO** — Commodore. **DEC** — Digital. **DR** — Dragon Data. **EP** — Epson. **GR** — Grundy Business. **IBM** — IBM. **JU** — Jupiter Cantab. **LO** — Lowe Electronics. **MA** — Mattel. **MI** — Midlectron. **OR** — Oric. **OS** — Osborne Computers. **PO** — Portico Technology. **RX** — Rank Xerox. **SH** — Sharp. **SI** — Sinclair. **SB** — Sirtel. **TA** — Tandy. **TI** — Texas Instruments.



Don't carry a LOAD on your shoulders, unburden yourself on *PCN*'s letters page.

Printers' destiny in hands of Coleman

Please inform Mr J Nixon of Pinner, Middlesex that the price of printers is entirely in my hands. The price will drop sharply 48 hours after I have bought one.
D S Coleman
Devizes, Wilts

Keeping Microtan alive and kicking

Up till now I have resisted the temptation to write to any magazine on my favourite subject of computing but I'm afraid your article this week *Raising Microtan* (*PCN issue 26*), has spurred me into action!

I'd like to take issue with G E Chkiantz by saying that the Microtan is not dead and isn't likely to be when there are 3,000 users and enthusiasts out there already and are all keen and staunch supporters of the Tangerine Users Group (TUG). Being an active member myself, and recipient of the excellent monthly newsletter (which seems to get better every month), I'd like to send a little praise in the direction of the leader of our merry band of men, namely Mr Bob Green, without whose help, the Microtan 65 system would have died long ago.

PCN £10 Star Letter



I hate to disillusion the obviously sincere efforts of Microtanic but I'm afraid they seem to be barking up the wrong tree. Our Group (TUG) has had an 80 column card for the M'tan for getting on for a year now, in the shape of the VDU 80/82 card and considering its power (independent processor driven) is excellent value for money, and can be bought in kit form, which keeps the original spirit of this type of system going. I use my system for work and play and have yet to find another computer which can offer me the same facilities in so flexible a package and at so flexible a price. That's the beauty of it. It can cost as much or as little as you like.

The reason that I praise TUG and its efforts is quite simple. Whilst Mr Green does get involved in commercial products — we buy them — he has always tried his hardest to give the members value for money.

Probably the best example of this was our first serious hardware project, the Programable Graphics Module (PGM). This card to me epitomises all that is good about user group type projects where everyone gets involved and everyone eventually benefits. It provided us with all the things that TCS's high definition card could and with added bonus of user defined graphics. On top of that it only used up one K of memory and with it's associated Toolkit (written by a group member) easily outperforms anything else I have seen on this system.
P Wellon,
Margate, Kent

Anxious Newbrain newcomer

I very much hope that, in spite of the apparent collapse of Grundy Business Systems, which makes Newbrain home computers, you will continue to provide articles and support for this machine in your excellent magazine. I have come to depend upon your information for an understanding of how the Newbrain works — and I have still some way to go!
David Dawson Taylor
Fareham, Hants

Our news team has kept you up to date with the Grundy saga and will, of course, continue to do so. Meanwhile we'll carry on featuring the Newbrain in our pages to help all of you make the most of your micro — Ed.

All's fair at computer fairs

I refer to your article in *PCN Issue 25* on your reporter's visit to the last ZX Microfair held at Alexandra Palace on August 20, and his observation that the exhibitors are there to make money.

Money? What money? Did your reporter see Imagine, Bug Byte, Psion, Artic or Silversoft? I cannot believe that if *real* money was involved *they* would pass up such an opportunity to compete for a share.

PDQ Software has exhibited at the last five Microfairs and yes, it has grown from a collection of disorganised enthusiasts to an almost fully blown exhibition — as indeed has the home computer business. However, this new sophistication has not affected the attitudes of the exhibitors or the expectations of the visitors. Advice often sought is freely and (sometimes at length) courteously given, even though it may be quite unconnected with the products on display. After all, we all share the same interest.

Yes, a degree of 'roll up, roll up' does exist, but it has to be remembered that stands, space, staff, display material etc all have to be paid for and must, if we are to exhibit in future, be earned and paid for by the show.

To date, no alternative facility exists for interested Sinclair owners to see, try, discuss and — dare I say — purchase such a mixed and varied range of products and ideas for their computer all under one roof. Such a facility users of other micros would dearly love to have.

How about *PCN* and *PCW* sponsoring a number of stands at the next ZX Microfair for schools, clubs and non-commercial organisations?
John W Weston
PDQ Software, Kent

Now there's an idea . . . why not a roll-up, roll-up, get your PCNs and free advice here! Good plan — Ed.

BBC lacks the educational packs

I have owned my BBC Model B computer for just over one year and have recently upgraded to OS 1.2 and Wordwise (such a useful tool).

There is one thing, though, that really puzzles me about the BBC computer. For a machine almost perfectly suited to educational use, why oh why, is there such a shortage of good educational software?

I have seen quite a few programs in magazines which purport to be educational, but on further investigation most are very poor quality indeed. I have two sons ages 8 and 10 and between us we have gathered a collection of programs based directly on work they are doing at school.

Could you please tell me, for instance, why the programs that are made available to schools by MEP, CET and Muse etc, are not readily available for sale, so that interested parents like myself could purchase them.

I ask myself, though, could it have something to do with profit margins? By that I mean programs that education authorities are being charged a lot of money for would quite simply sell for such prices on the open market.

I find myself wondering if Sir Clive Sinclair's latest idea of releasing them to the market place is going to catch on. I for one certainly hope so.
Mr R Hughes
Dagenham, Essex

Share your thoughts in the UK's liveliest micro weekly letters columns. Funny, feisty or fanciful, your letter could win you £10 if it's of star status.
WRITE TO: Random Access, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.



ROUTINE INQUIRIES

Lost in a maze of bits and bytes, trapped in a forest of errors, or bugged by Basic? Whatever your problem, access our HELP function . . . better known as Max Phillips.

Write to: Max Phillips, Routine Inquiries, *Personal Computer News,* VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

A Ks of more memory

Q Please could you give me some information on the Spectrum as I am thinking of buying one. Could you tell me what the difference is between a 16K and a 48K Spectrum?

L Willis,
Plymouth, Devon

A Most magazines include lots of info about the Spectrum — either articles or in Sinclair's own ads. You'll get a good overview if you get hold of the Spectrum Micropaedia (*PCN issues 14, 15 and 16*). The other thing to do is to get some hands-on experience for yourself — either at your local Smiths or preferably local club.

The difference between the 16K and 48K models is, of course, 32K. Seriously though, these numbers refer to the amount of memory in the computer — a bit like the difference between a 1300 and two litre car. The 48K version gives you space for bigger and better programs and is definitely worth the extra if you have it. The 16K is an economy version though you can get it upgraded to a 48K machine as soon as funds allow.

Programmers chase the Ace

Q Recently, I began sending in new ideas for cartridges to the people who make my TV game, Acetronic. I was disappointed to receive a letter which said that they could not use my unsolicited ideas.

I thought my ideas were more interesting than those available. They have no 3D games. Can't they be persuaded to get a move on with new games? Should I sell the game altogether?

Mr R E Harris,
Leeds, Yorkshire

A I'm afraid Acetronic can do what it likes with its products. Obviously, the company is quite happy with the games it markets. It certainly isn't obliged to consider ideas if it doesn't want to.

So there's little you can do. If the games are as bad as you say they are and Acetronic wants to keep selling the game, it will come up with the goods. So you could wait in hope.

Alternatively, you could consider a home micro such as a 48K Spectrum. You'll find a massive range of some incredible games — mostly at very reasonable prices. And if you do think of some original and exciting games, you'll find small software houses are usually happy to handle new ideas.

Lock-tight super clues

Q I have been trying to write a security routine on my 48K Spectrum along the lines that only the right code word will allow access to the program proper.

The only problem is that the program can be listed and the code word discovered. So can you give me the POKE that disables the Break key?

Andrew Cook,
Oadby, Leicestershire.

A The standard POKE for disabling Break on a Spectrum is widely published — try your back issues of *PCN* for starters! The problem is that people also frequently know ways round it. So, by all means make it your first line of defence but if you need more security, you should be more devious.

There's no reason why the code word should be visible in the listing. Convert it to its ASCII codes and hide it. POKE it into a REM statement. NOT all its bits and write it out backwards in a DATA statement. Encode it! The more determined and skilled you are, the more people you'll beat.

Of course, people can spot what's going on if your program then pulls out the coded password and converts back into an ASCII string. So go the other way. Input the user's attempt at the password and encode that and compare it with the coded version of the password.

There are two other things that need to be done to get this method to work. Once you've got the user's password, keep it and periodically check it against the real password throughout the program. That way, if they just GOTO over the original password entry section, the program will catch them at the next check.

Lastly, checksum your code regularly by PEEKing back from the Basic program area. Don't add up too long blocks — you'll slow the program down. But adding together a few bytes here and there should tell you if anyone has fiddled with the program and tried to remove or bypass the protection.

This method may seem a lot of effort. But the effort of breaking it is a bigger put off than beating a simple LISTing disable. But if you are using seriously personal and sensitive data, do remember that any protection scheme can be beaten.

It's best not to let them get near the program for starters. Try keeping the cassettes under your pillow!

Consult the Oricle

Q I am planning to upgrade my ZX81 (have RAMpack — will wobble) and have around £130 to spend. My next machine must be able to access Prestel and similar databases.

I've had the Oric 1 set in my sights. However the last reviews I read were six or seven months ago and were mostly conducted on pre-production models. The ROM was shown to have almost disastrous bugs. Have these been cleared up yet? For example, do cassette, data and screen files save successfully?

Lastly, is there a Prestel compatible modem available for the Spectrum yet?

Ian Mitchell,
South Shields, Tyne and Wear

A The good news is that you can get a Prestel compatible modem for the Spectrum. It's a Prism system designed for use with Micronet and you can read a full Pro-test in next week's *PCN* (issue 30). The system is a direct connect modem and sells for £75. With the possible exception of the Microdrive and ZXnet, it's the single most important piece of hardware yet to emerge for the Spectrum.

The Oric has yet to be blessed with its modem, though this sudden outburst in popularity will encourage either Oric or others to provide one soon. As for the Oric's ROM, the world is still awaiting a revised version. The last word Oric is that it planned one. However, replacing existing ROMs will prove a hurdle. Remember that the Oric's case is supposedly sealed!

However, most of the problems with existing machines have been documented by now and relevant patches are available. The lack of cassette filing can be compensated for using routines published by Oric in its Oric Owner magazine. Even so, a micro with Prestel ability has to be a Spectrum.

Stuck in the Dragon's maze

Q I am writing a program for the Dragon 32 which involves a little man moving about a high resolution maze. How can I stop the man moving through the walls of the maze?

The maze is drawn with DRAW and the man moved with GET and PUT.

Gavin Parnell,
King's Lynn, Norfolk.

A I'm afraid that this is something you should have thought of before you coded the program. I hope you haven't got too far before you discovered this problem.

There are lots of possible ways to do it. As you've probably realised using PPOINT to check individual points on the screen is just going to be plain slow. The most popular method is probably to keep a version of the maze in an array separate to that which appears on the screen.

Each element of the array contains a number which indicates where the walls are for that square on the maze. And of course, you would keep a note of the man's position in the array as well as on the screen.

This system sounds horribly complicated, but if your program generates its own mazes, you may already be using a similar array. Let's try a simple coding system. Each square on the maze grid can have any of four exits blocked with a wall. Suppose the top wall has a value of 1, the left wall a value of 2, the right wall is 4 and the bottom wall is 8.

So, to see if your man can move down, you could use a test like IF A(X,Y)>= THEN PRINT "YOU CAN'T GO THAT WAY", where A is the array and X and Y are the man's position in the maze.



MICROWAVES

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Secret dossier on the BBC

When using the DFS on the BBC it may be necessary to save a file secretly — so secretly that even when you *CAT the disk, the file does not show up. The way to do this is to type the following:

SAVE *"press shift and any function key"* (Return)
*CAT
NEW
LOAD *"press shift and the same function key"* (Return)

You will see that the program that you saved did not show up onthe *CAT but did reload. It will only work, however, on OS 1.2.

J Blatch,
Newton Abbot, South Devon

Get your Lynx into shape

The Lynx has tremendous graphic potential, but it lacks graphic commands to draw shapes. The procedure given in figure 1 is faily compact and allows you to draw circles, octagons, pentagons and triangles.

A circle should be drawn with S=1, but this is very slow. S=20 does just as well and is quite a bit faster. An alternative way of speeding the procedure up, is to use the TEXT command.

- A is the horizontal position of the centre of the shape.
- B is the vertical size.
- S is 360 divided by the number of desired sides.

An octagaon whould be produced by S=5.

W Clayburn,
Middlesex

```
100 DEFPROC CIRCLE(X,Y,A,B,S)
110 MOVE X,Y+B
120 DRAW X+A*SIN(RAD(P)),Y+B*COS(RAD(P))
130 NEXT P
140 ENDPROC
```

Figure 1

This is the BBC light program

Having got over my hysterics in the letter (*PCN issue 27*) about people having trouble with green screens, it occured to me that this program (figure 2) might be of some use.

The program is for the BBC micro, and displays all 64 combinations of foreground and background colours.

For the benefit of those confined to monochrome monitors, each pairing of colours identifies itself. Incidentally, the data lines are almost exact repetitions, and are therefore easily entered using the Beeb's copy facility.

Martin Miles,
Manchester

```
>L.
   10 MODE2
   20 VDU14
   30 FORA=0TO7
   40   READcolour$
   50   COLOURA
   60   FORB=128TO135
   70     READColour$
   80     COLOURB
   90     PRINT colour$;A" TEXT ON"
  100     PRINT Colour$;B" GROUND"
  110     NEXT:NEXT
  120 GOTO30
  130 DATA BLACK, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
  140 DATA RED, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
  150 DATA GREEN, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
  160 DATA YELLOW, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
  170 DATA BLUE, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
  180 DATA MAGENTA, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
  190 DATA CYAN, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
  200 DATA WHITE, BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, WHITE
```

Figure 2

All clear on the Lynx

The Lynx does not have a CLEAR command to clear the variables and arrays. The following machine code program performs this command. It should be entered with the monitor and can be located anywhere.

The code is:

CD CA 25 CD 8E 1F 2A FC 01 23 22 1F 02 C9

Or in assembler:

```
CD CA 25    CALL 25CA
CD 8E 1F    CALL 1F8E
2A FC 01    LD HL,(01FC)
23          INC HL
22 1F 02    LD (621F), HL
C9          RET
```

Simon Rushton,
N Yorks

Lovely listings

Adding colour to listings can be useful for highlighting special parts of a program, and can easily be achieved by following these steps.

Before the block to be coloured, type the following line (the commas should be ommited).

Line numer, R, E, M, shift and 2, shift and 2, INST DEL, CTRL and 9, T, shift and M, T, one of the special colour symbols listed below, Return.

The special symbols for each colour are:

Shift and P: Black
E: White
‘: Red
CBM key and *: Cyan
CBM key and —: Purple
^: Green
: Blue
Shift and A: Orange
Shift and U: Brown
Shift and V: Light Red
Shift and W: Grey 1
Shift and X: Grey 2
Shift and Y: Light Green
Shift and Z: Light Blue
Shift and ^: Yellow
Shift and +: Grey 3

David Gristwood,
Tyne and Wear

Bug spotting on the Beeb

There seems to be a bug in the BBC micro's 0.1 ROM.

If the following is entered:

558PRINT"PCN"
OLD
558PRINT"PCN"
OLD
558PRINT"PCN2"

Then enter LIST, the following lines have appeared.

46PRINT"PCN"
558PRINT"PCN2"

E Radcliffe and R King,
Isle of Man

This also happens in OS 1.2 and with the BBC's new Basic ROM . . . Ed.

Just the thing for strings

Have you ever wanted to print a piece of a string in Basic? You'll probably have used the MID$ (STRINGNAME$, START, LENGTH) function, which will extract a piece of a string from the middle.

But you can also use this to decide not only how much of the string you want to print, but whether it is to be printed or not.

This is achieved by taking a piece, starting wherever you want, for a given length. If you multiply the expression for the length by a *logical* expression (ie one which evaluates to 1 or 0), which contains the decision you wish to make, then if the expression is *true* the length will be left as set.

But if the expression is not *true*, then because the length is multiplied by 0, it also becomes 0. The result is a string of no length. It won't make a lot of difference to the output, even though it is printed.

Try typing in this little program and running it. You will see the 'HELLO!' appear and disappear, even though both PRINT statements are exactly the same.

```
10 WORD$ = 'HELLO!'
20 MESSAGE$ = 'HERE I AM!'
30 FLAG = 0
40 PRINT MID$( WORD$, 1, LEN( WORD$) * FLAG ); MESSAGE$
50 FLAG = 1
60 PRINT MID$( WORD$, 1, LEN( WORD$) * FLAG ); MESSAGE$
70 GOTO 30
```

LIST laughs at locks

From time to time it's useful to be able to take a look at Basic programs you have bought, but generally the manufacturers put a lock onto the code to prevent you from doing so, and perhaps copying it.

Instead of giving the command LIST, which will try to list the program from line 0 and fail, since line 0 is locked, command it to LIST 1. Then the listing will begin at line 1, which is frequently not locked.

Delve into the depths of Epson's HX-20 with a machine code disassembler — Elizabeth Wald explains.

The HX unravelled

The Epson HX-20 has a powerful monitor which enables the user easily to enter machine code programs. However, listing such programs can be laborious and slow, and requires you to be familiar with the hexadecimal codes. It is therefore useful to have a disassembler program to allow listings to be made using the standard 6301 machine code mnemonics.

6301 machine code is based on 6800 machine code with the addition of several new instructions (see table). Most of these additional instructions are the direct result of the ability to combine registers A and B to form a 16 bit register, known as D. Within register D the upper 8-bits are formed by A, and B forms the lower 8-bits. Any alteration to the contents of A or B will affect register D, and vice versa.

6301 INSTRUCTIONS NOT FOUND IN 6800

	IMPLIED	IMMEDIATE	DIRECT	INDEXED	EXTENDED
ADD D	—	C3	D3	E3	F3
ASL D	05	—	—	—	—
LDD	—	CC	DC	EC	FC
LSR D	04	—	—	—	—
MUL	3D	—	—	—	—
PSH X	3C	—	—	—	—
PUL X	38	—	—	—	—
SLP	1A	—	—	—	—
STD	—	—	DD	ED	FD
SUB D	—	83	93	A3	B3
XGDX	18	—	—	—	—

The instructions using register D are as follows: 'LDD' and 'STD' will load and store register D respectively. Addition and subtraction are done by 'ADD D' and 'SUB D' placing the result in D. All four instructions can be used on the immediate, direct, indexed or extended modes, with the obvious exception of 'STD' which cannot be used in the immediate mode. It is possible to perform an arithmetic shift left ('ASL D') and a logical shift right ('LSR D'). The contents of D can be exchanged with the contents of X using the 'XGDX' instruction.

Further instructions provided are a multiply instruction (MUL), which multiplies register A by register B, and places the result in register D, instructions to push or pull register X ('PSH X' and 'PUL X') and a 'sleep' instruction ('SLP'), which sends the processor into a low power 'sleep' mode.

The final group of additional instructions on the 6301 are the so-called

```
0B00 3C PSH X
0B01 36 PSH A
0B02 37 PSH B
0B03 07 TPA
0B04 36 PSH A
0B05 BF STS     0BD0
0B08 FE LDX     0BD4
0B0B 27 BEQ     0B18
0B0D BE LDS     0BD2
0B10 CC LDA D £0000
0B13 FD STA D  0BD4
0B16 6E JMP    X00
0B18 BE LDS     0BD2
0B1B 3B RTI
0B1C 01 NOP
0B1D 01 NOP
0B1E 01 NOP
0B1F 01 NOP
0B20 3C PSH X
0B21 36 PSH A
0B22 37 PSH B
0B23 07 TPA
0B24 36 PSH A
0B25 BF STS     0BD2
0B28 BE LDS     0BD0
0B2B 3B RTI
0B2C 01 NOP
0B2D 01 NOP
0B2E 01 NOP
0B2F 02 ***
0B30 86 LDA A £01
0B32 B7 STA A  0BFE
0B35 BD JSR     0B20
0B38 B6 LDA A  0BFF
0B3B 39 RTS
0B3C 01 NOP
0B3D 01 NOP
0B3E 8D BSR     0B30
0B40 37 PSH B
0B41 36 PSH A
0B42 B7 STA A  0BFF
0B45 4F CLR A
0B46 F6 LDA B  0B2F
0B49 F7 STA B  0BFE
0B4C 32 PUL A
0B4D 33 PUL B
0B4E 20 BRA     0B20
0B50 01 NOP
0B51 01 NOP
0B52 01 NOP
0B53 01 NOP
0B54 86 LDA A £FF
0B56 B7 STA A  0BFE
0B59 BE LDS     0BD0
0B5C 3B RTI
0B5D 01 NOP
0B5E 01 NOP
0B5F 01 NOP
0B60 8D BSR     0B3E
0B62 80 SUB A £30
0B64 81 CMP A £0A
0B66 25 BCS     0B6A
0B68 80 SUB A £07
0B6A 39 RTS
0B6B 8D BSR     0B60
0B6D 48 ASL A
0B6E 48 ASL A
0B6F 48 ASL A
0B70 48 ASL A
0B71 37 PSH B
0B72 36 PSH A
```

```
0B73 8D BSR     0B60
0B75 33 PUL B
0B76 1B ABA
0B77 33 PUL B
0B78 39 RTS
0B79 00 ***
0B7A 00 ***
0B7B 00 ***
0B7C 00 ***
0B7D 00 ***
0B7E 00 ***
0B7F 00 ***
0B80 37 PSH B
0B81 36 PSH A
0B82 8D BSR     0B6B
0B84 16 TAB
0B85 8D BSR     0B6B
0B87 36 PSH A
0B88 37 PSH B
0B89 38 PUL X
0B8A 32 PUL A
0B8B 33 PUL B
0B8C 39 RTS
0B8D 01 NOP
0B8E 01 NOP
0B8F 01 NOP
0B90 8B ADD A £30
0B92 81 CMP A £3A
0B94 25 BCS     0B98
0B96 8B ADD A £07
0B98 20 BRA     0B40
0B9A 36 PSH A
0B9B 36 PSH A
0B9C 44 LSR A
0B9D 44 LSR A
0B9E 44 LSR A
0B9F 44 LSR A
0BA0 8D BSR     0B90
0BA2 32 PUL A
0BA3 84 AND A £0F
0BA5 8D BSR     0B90
0BA7 32 PUL A
0BA8 39 RTS
0BA9 36 PSH A
0BAA 3C PSH X
0BAB 32 PUL A
0BAC 8D BSR     0B9A
0BAE 32 PUL A
0BAF 8D BSR     0B9A
0BB1 32 PUL A
0BB2 39 RTS
0BB3 00 ***
0BB4 00 ***
0BB5 00 ***
0BB6 00 ***
0BB7 00 ***
0BB8 36 PSH A
0BB9 86 LDA A £20
0BBB 8D BSR     0B40
0BBD 32 PUL A
0BBE 39 RTS
0BBF 01 NOP
0BC0 7F CLR     0B2F
0BC3 39 RTS
0BC4 36 PSH A
0BC5 86 LDA A £02
0BC7 B7 STA A  0B2F
0BCA 32 PUL A
0BCB 39 RTS
0BCC 01 NOP
0BCD 01 NOP
```

```
0BCE 01 NOP
0BCF 01 NOP
0F00 8E LDS    £0BEF
0F03 8D BSR     0F05
0F05 38 PUL X
0F06 18 XDX
0F07 83 SUB D £0305
0F0A FD STA D  0BF0
0F0D C3 ADD D £0100
0F10 FD STA D  0BF2
0F13 86 LDA A £3F
0F15 BD JSR     0BC4
0F18 01 NOP
0F19 01 NOP
0F1A 01 NOP
0F1B 01 NOP
0F1C 01 NOP
0F1D 01 NOP
0F1E 01 NOP
0F1F 01 NOP
0F20 01 NOP
0F21 01 NOP
0F22 01 NOP
0F23 01 NOP
0F24 01 NOP
0F25 01 NOP
0F26 01 NOP
0F27 86 LDA A £0D
0F29 BD JSR     0B40
0F2C 86 LDA A £0A
0F2E BD JSR     0B40
0F31 FE LDX     0BF4
0F34 BD JSR     0BA9
0F37 BD JSR     0BB8
0F3A A6 LDA A X00
0F3C 08 INX
0F3D FF STX     0BF4
0F40 BD JSR     0B9A
0F43 BD JSR     0BB8
0F46 C6 LDA B £02
0F48 3D MUL
0F49 F3 ADD D  0BF2
0F4C 18 XDX
0F4D FF STX     0BF8
0F50 A6 LDA A X00
0F52 C6 LDA B £03
0F54 3D MUL
0F55 F3 ADD D  0BF0
0F58 18 XDX
0F59 C6 LDA B £03
0F5B A6 LDA A X00
0F5D 08 INX
0F5E BD JSR     0B40
0F61 5A DEC B
0F62 26 BNE     0F5B
0F64 BD JSR     0BB8
0F67 FE LDX     0BF8
0F6A A6 LDA A X01
0F6C 36 PSH A
0F6D C6 LDA B £20
0F6F 84 AND A £70
0F71 27 BEQ     0F86
0F73 C6 LDA B £41
0F75 81 CMP A £20
0F77 27 BEQ     0F86
0F79 5C INC B
0F7A 81 CMP A £30
0F7C 27 BEQ     0F86
0F7E C6 LDA B £44
0F80 81 CMP A £40
0F82 27 BEQ     0F86
```

```
0F84 C6 LDA B £58
0F86 17 TBA
0F87 BD JSR     0B40
0F8A BD JSR     0BB8
0F8D 32 PUL A
0F8E 36 PSH A
0F8F 84 AND A £0C
0F91 C6 LDA B £20
0F93 4D TST A
0F94 27 BEQ     0FA3
0F96 C6 LDA B £23
0F98 81 CMP A £04
0F9A 27 BEQ     0FA3
0F9C 5C INC B
0F9D 81 CMP A £08
0F9F 27 BEQ     0FA3
0FA1 C6 LDA B £58
0FA3 17 TBA
0FA4 BD JSR     0B40
0FA7 FE LDX     0BF4
0FAA 32 PUL A
0FAB 81 CMP A £80
0FAD 24 BCC     0FDB
0FAF 84 AND A £03
0FB1 16 TAB
0FB2 5A DEC B
0FB3 27 BEQ     0FBD
0FB5 A6 LDA A X00
0FB7 BD JSR     0B9A
0FBA 08 INX
0FBB 20 BRA     0FB2
0FBD FF STX     0BF4
0FC0 BC CPX     0BF6
0FC3 22 BHI     0FCE
0FC5 FC LDA D  0BF0
0FC8 C3 ADD D £0322
0FCB 18 XDX
0FCC 6E JMP    X05
0FCE 86 LDA A £0D
0FD0 BD JSR     0B40
0FD3 86 LDA A £0A
0FD5 BD JSR     0B40
0FD8 7E JMP     0B54
0FDB E6 LDA B X00
0FDD 08 INX
0FDE FF STX     0BF4
0FE1 F7 STA B  0BF9
0FE4 4F CLR A
0FE5 5D TST B
0FE6 2A BPL     0FE9
0FE8 4A DEC A
0FE9 B7 STA A  0BF8
0FEC 18 XDX
0FED F3 ADD D  0BF8
0FF0 18 XDX
0FF1 BD JSR     0BA9
0FF4 FE LDX     0BF4
0FF7 20 BRA     0FBD
0FF9 01 NOP
0FFA 01 NOP
0FFB 01 NOP
0FFC 01 NOP
0FFD 01 NOP
0FFE 01 NOP
0FFF 01 NOP
0C00 4E 4F 50 NOP
0C03 4C 53 52 LSR
0C06 41 53 4C ASL
0C09 54 41 50 TAP
0C0C 54 50 41 TPA
0C0F 49 4E 58 INX
```

```
0C12 44 45 58 DEX
0C15 43 4C 56 CLV
0C18 53 45 56 SEV
0C1B 43 4C 43 CLC
0C1E 53 45 43 SEC
0C21 43 4C 49 CLI
0C24 53 45 49 SEI
0C27 53 42 41 SBA
0C2A 43 42 41 CBA
0C2D 54 41 42 TAB
0C30 54 42 41 TBA
0C33 58 44 58 XDX
0C36 44 41 41 DAA
0C39 53 4C 50 SLP
0C3C 41 42 41 ABA
0C3F 42 52 41 BRA
0C42 42 52 4E BRN
0C45 42 48 49 BHI
0C48 42 4C 53 BLS
0C4B 42 43 43 BCC
0C4E 42 43 53 BCS
0C51 42 4E 45 BNE
0C54 42 45 51 BEQ
0C57 42 56 43 BVC
0C5A 42 56 53 BVS
0C5D 42 50 4C BPL
0C60 42 4D 49 BMI
0C63 42 47 45 BGE
0C66 42 4C 54 BLT
0C69 42 47 54 BGT
0C6C 42 4C 45 BLE
0C6F 54 53 58 TSX
0C72 49 4E 53 INS
0C75 50 55 4C PUL
0C78 44 45 53 DES
0C7B 54 58 53 TXS
0C7E 50 53 48 PSH
0C81 52 54 53 RTS
0C84 41 42 58 ABX
0C87 52 54 49 RTI
0C8A 4D 55 4C MUL
0C8D 57 41 49 WAI
0C90 53 57 49 SWI
0C93 4E 45 47 NEG
0C96 43 4F 4D COM
0C99 52 4F 52 ROR
0C9C 41 53 52 ASR
0C9F 52 4F 4C ROL
0CA2 44 45 43 DEC
0CA5 49 4E 43 INC
0CA8 54 53 54 TST
0CAB 43 4C 52 CLR
0CAE 41 49 4D AIM
0CB1 4F 49 4D OIM
0CB4 45 49 4D EIM
0CB7 54 49 4D TIM
0CBA 4A 4D 50 JMP
0CBD 53 55 42 SUB
0CC0 43 4D 50 CMP
0CC3 53 42 43 SBC
0CC6 41 4E 44 AND
0CC9 42 49 54 BIT
0CCC 4C 44 41 LDA
0CCF 53 54 41 STA
0CD2 45 4F 52 EOR
0CD5 41 44 43 ADC
0CD8 4F 52 41 ORA
0CDB 41 44 44 ADD
0CDE 43 50 58 CPX
0CE1 42 53 52 BSR
0CE4 4A 53 52 JSR
```

```
0CE7 4C 44 53 LDS
0CEA 53 54 53 STS
0CED 4C 44 58 LDX
0CF0 53 54 58 STX
0CF3 2A 2A 2A ***
0CF6 00 00 00 ...
0CF9 00 00 00 ...
0CFC 00 00 00 ...
0CFF 00       .

0D00 51 01 00 01 Q...
0D04 51 01 51 01 Q.Q.
0D08 01 41 02 41 .A.A
0D0C 03 01 04 01 ....
0D10 05 01 06 01 ....
0D14 07 01 08 01 ....
0D18 09 01 0A 01 ....
0D1C 0B 01 0C 01 ....
0D20 0D 01 0E 01 ....
0D24 51 01 51 01 Q.Q.
0D28 51 01 51 01 Q.Q.
0D2C 0F 01 10 01 ....
0D30 11 01 12 01 ....
0D34 13 01 14 01 ....
0D38 51 01 51 01 Q.Q.
0D3C 51 01 51 01 Q.Q.
0D40 15 82 16 82 .T.T
0D44 17 82 18 82 .T.T
0D48 19 82 1A 82 .T.T
0D4C 1B 82 1C 82 .T.T
0D50 1D 82 1E 82 .T.T
0D54 1F 82 20 82 .T T
0D58 21 82 22 82 !T"T
0D5C 23 82 24 82 #T$T
0D60 25 01 26 01 %.&.
0D64 27 21 27 31 '!'1
0D68 28 01 29 01 (.).
0D6C 2A 21 2A 31 *!*1
0D70 27 51 2B 01 'Q+.
0D74 2C 01 2D 01 ,.-.
0D78 2A 51 2E 01 *Q..
0D7C 2F 01 30 01 /.0.
0D80 31 21 51 01 1!Q.
0D84 51 01 32 21 Q.2!
0D88 01 21 51 01 .!Q.
0D8C 33 21 34 21 3!4!
0D90 02 21 35 21 .!5!
0D94 36 21 51 01 6!Q.
0D98 37 21 38 21 7!8!
0D9C 51 01 39 21 Q.9!
0DA0 31 31 51 01 11Q.
0DA4 51 01 32 31 Q.21
0DA8 01 31 51 01 .1Q.
0DAC 33 31 34 31 3141
0DB0 02 31 35 31 .151
0DB4 36 31 51 01 61Q.
0DB8 37 31 38 31 7181
0DBC 51 01 39 31 Q.91
0DC0 31 0E 3A 0F 1.:.
0DC4 3B 0F 32 0E ;.2.
0DC8 01 0E 3C 0F ..<.
0DCC 33 0E 34 0E 3.4.
0DD0 02 0E 35 0E ..5.
0DD4 36 0E 3D 0F 6.=.
0DD8 37 0E 38 0E 7.8.
0DDC 3E 0E 39 0E >.9.
0DE0 31 03 3A 0B 1.:.
0DE4 3B 0B 32 03 ;.2.
0DE8 01 03 3C 0B ..<.
0DEC 33 03 34 03 3.4.
0DF0 02 03 35 03 ..5.
```

'immediate mode' instructions, of which there are four: 'AIM' (And Immediate Mode), 'EIM' (Exclusive or), 'OIM' (Or) and'TIM' (Test). Each instruction requires one byte of immediate data, and a direct or indexed mode memory address. These instructions perform the appropriate logical operation on the immediate data and the contents of the specified location. The first three instructions place the result in the memory location, but 'TIM' merely sets the N and Z (negative and zero) flags, and discards the result. Note that the 'TIM' instruction is similar to the 'AIM' instruction, and not to the 6800 instruction 'TST'. The machine code requires that the immediate data is the first byte following the op-code, and the address the second byte.

The Basic program provided stores the machine code, held in data statements, and transfers control to the machine code program at &HOBOO. The program operates as follows:

1000 Prints 'wait' message.
1010 Stores machine code program.
1020 & 1030 Define functions to obtain the upper and lower bytes of an address entered as a string.
1040 Selects the language, sets top address for machine code stack and start address of machine code program.
1050 & 1055 Input & store the start address for disassembly.
1060 & 1065 Input and store the end address for disassembly.
1070 Executes machine code until a character needs to be printed, or disassembly is finished.
1080 Loops back to line 1040.
1081 Checks whether the user wishes to terminate the program following a null input in lines 1050 or 1060.
1090 to 1690 Machine code data.

Machine code program

The machine code program set up by Basic operates as follows:

0B00-0B1B Save the Basic stack pointer, load the machine code stack pointer and transfer control to the main body of machine code at 0F00 onwards.

Subroutines:

0B20-0B2B Saves machine code stack pointer, loads basic stack pointer, and returns to Basic.
0B30-0B3B Character input routine from the keyboard.
0B40-0B4E Character output routine to the display.
0B54-0B5C Routine to terminate the machine code program.
0B60-0B6A Inputs one hezadecimal digit.
0B6B-0B78 Inputs two hexadecimal digits.
0B80-0B8C Inputs four hexadecimal digits.
0B90-0B98 Prints one hexadecimal digit.
0B9A-0BA8 Prints two hexadecimal digits.
0BA9-0BB2 Prints four hexadecimal digits.
0BB8-0BBE Prints a space.
0BC0-0BC3 Sets output mode to LCD.
0BC4-0BCB Sets output mode to internal printer.

Main program:

0F00-0F26 Start of main body of disassembler, initialization, etc.
0F27-0F2E Prints carriage return and line feed.
0F31-0F40 Prints address of instruction and op-code.
0F43-0F64 Prints mnemonic.
0F67-0F87 Prints register, if any.
0F8A-0FA4 Prints mode character, if any, ie '#', '$' or 'X'.
0FA7-0FAD Jumps to 0FDB if branch relative/BSR.
0FAF-0FBB Outputs one or two bytes of either address or data.
0FBD-0FC3 Branches to 0FCE to terminate the program if disassembly is completed.
0FC5-0FCC Branches back to 0F27.
0FDB-0FF7 Calculates and prints the absolute address, for a relative branch or 'BSR', from the relative offset, and branches to 0FBD.

Locations 0C00-0EFF hold two tables: 0C00-0CF5 contains a list of mnemonics, and 0D00-0EFF contains two bytes per op-code, the first byte representing the mnemonic number, and the second byte the relevant details.

Using the program

On typing 'RUN' the program displays 'PLEASE WAIT: LOADING' to indicate that the machine code is being set up. This is followed by prompts for the start and end addresses of the memory area to be disassembled. The addresses are entered in hexadecimal but the prefix '&H' is not required. The program may be terminated at this point by pressing 'RETURN', and the user confirms that the program is to be terminated by entering 'Y', or 'N' to continue.

The program prints the disassembled program, one instruction per line, in five columns. Column one contains the instruction's address as a four digit hexadecimal number. The second column contains two hexadecimal digits representing the op-code, and third column gives the corresponding mnemonic. The fourth column gives the register, if applicable, and the fifth column contains the address or data field, in either immediate ('#'), direct ('$'), indexed ('X') or extended mode.

All branches and branch to subroutine instructions are followed by an absolute address.

Illegal op-codes are printed as '***', and the following mnemonics have been changed: 'INX', 'DEX', 'LDD' and 'STD' are printed as 'INC X', 'DEC X', 'LDA D' and 'STA D' respectively, and 'XGDX' has been changed to 'XDX'.

```
0DF4 36 03 3D 0B 6.=.
0DF8 37 03 38 03 7.8.
0DFC 3E 03 39 03 >.9.
0E00 3F 26 40 26 ?&@&
0E04 41 26 3F 47 A&?G
0E08 42 26 43 26 B&C&
0E0C 44 26 51 01 D&Q.
0E10 46 26 47 26 F&G&
0E14 48 26 49 26 H&I&
0E18 4A 07 4B 82 J.K.
0E1C 4D 07 51 01 M.Q.
0E20 3F 2A 40 2A ?*@*
0E24 41 2A 3F 4A A*?J
0E28 42 2A 43 2A B*C*
0E2C 44 2A 45 2A D*E*
0E30 46 2A 47 2A F*G*
0E34 48 2A 49 2A H*I*
0E38 4A 0A 4C 0A J.L.
0E3C 4D 0A 4E 0A M.N.
0E40 3F 2E 40 2E ?.@.
0E44 41 2E 3F 4E A.?N
0E48 42 2E 43 2E B.C.
0E4C 44 2E 45 2E D.E.
0E50 46 2E 47 2E F.G.
0E54 48 2E 49 2E H.I.
0E58 4A 0E 4C 0E J.L.
0E5C 4D 0E 4E 0E M.N.
0E60 3F 23 40 23 ?#@#
0E64 41 23 3F 43 A#?C
0E68 42 23 43 23 B#C#
0E6C 44 23 45 23 D#E#
0E70 46 23 47 23 F#G#
0E74 48 23 49 23 H#I#
0E78 4A 03 4C 03 J.L.
0E7C 4D 03 4E 03 M.N.
0E80 3F 36 40 36 ?6@6
0E84 41 36 49 47 A6IG
0E88 42 36 43 36 B6C6
0E8C 44 36 51 01 D6Q.
0E90 46 36 47 36 F6G6
0E94 48 36 49 36 H6I6
0E98 44 47 51 01 DGQ.
0E9C 4F 07 51 01 O.Q.
0EA0 3F 3A 40 3A ?:@:
0EA4 41 3A 49 4A A:IJ
0EA8 42 3A 43 3A B:C:
0EAC 44 3A 45 3A D:E:
0EB0 46 3A 47 3A F:G:
0EB4 48 3A 49 3A H:I:
0EB8 44 4A 45 4A DJEJ
0EBC 4F 0A 50 0A O.P.
0EC0 3F 3E 40 3E ?>@>
0EC4 41 3E 49 4E A>IN
0EC8 42 3E 43 3E B>C>
0ECC 44 3E 45 3E D>E>
0ED0 46 3E 47 3E F>G>
0ED4 48 3E 49 3E H>I>
0ED8 44 4E 45 4E DNEN
0EDC 4F 0E 50 0E O.P.
0EE0 3F 33 40 33 ?3@3
0EE4 41 33 49 43 A3IC
0EE8 42 33 43 33 B3C3
0EEC 44 33 45 33 D3E3
0EF0 46 33 47 33 F3G3
0EF4 48 33 49 33 H3I3
0EF8 44 43 45 43 DCEC
0EFC 4F 03 50 03 O.P.
1000 CLS:SOUND 6.5:PRINT
"PLEASE WAIT:LOADING"
1010 MEMSET &H2000:FOR I
%=&HB00 TO &HFFF:READ S$
:POKE I%,VAL("&H"+S$):NE
XTI%
1015 SOUND 26,5
1020 DEFFNH%(X$)=VAL("&H
"+LEFT$(SPACE$(4-LEN(X$)
)+X$,2))
1030 DEFFNL%(X$)=VAL("&H
"+RIGHT$(SPACE$(4-LEN(X$
))+X$,2))
1040 POKE&H7E,&H17:POKE&
HBD2,&HB:POKE&HBD3,&HEF:
POKE&HBD4,&HF:POKE&HBD5,
&H0
1050 INPUT"START DISSASS
 ";S$:IFLEN(S$)>4THEN 10
50 ELSE IF LEN(S$)=0THEN
1081
1055 POKE&HBF4,FNH%(S$):
POKE&HBF5,FNL%(S$)
1060 INPUT"END DISSASS
 ";S$:IF(LEN(S$)>4)THEN
1060 ELSE IF LEN(S$)=0TH
EN1081
1065 POKE&HBF6,FNH%(S$):
POKE&HBF7,FNL%(S$)
1070 EXEC&HB00:A%=PEEK(&
HBFE):IFA%=2THENA%=PEEK(
&HBFF):LPRINTCHR$(A%);:G
OTO1070
1080 GOTO 1040
1081 INPUT"TERMINATE Y/N
 ";Y$:IFY$="Y"THEN END E
LSEIFY$="N"THEN1080ELSE1
081
1090 DATA 3C,36,37,7,36,
BF,B,D0,FE,B,D4,27,B,BE,
B,D2,CC,0,0,FD,B
1100 DATA D4,6E,0,BE,B,D
2,38,1,1,1,1,3C,36,37,7,
36,BF,B,D2,BE,B
1110 DATA D0,38,1,1,1,2,
86,1,B7,B,FE,BD,B,20,B6,
B,FF,39,1,1,8D
1120 DATA F0,37,36,B7,B,
FF,4F,F6,B,2F,F7,B,FE,32
,33,20,D0,1,1,1,1
1130 DATA 86,FF,B7,B,FE,
BE,B,D0,38,1,1,1,8D,DC,8
0,30,81,A,25,2,80
1140 DATA 7,39,8D,F3,48,
48,48,48,37,36,8D,EB,33,
1B,33,39,0,0,0,0,0
1150 DATA 0,0,37,36,8D,E
7,16,8D,E4,36,37,38,32,3
3,39,1,1,1,88,30,81
1160 DATA 3A,25,2,8B,7,2
0,A6,36,36,44,44,44,44,8
D,EE,32,84,F,8D,E9,32
1170 DATA 39,36,3C,32,8D
,EC,32,8D,E9,32,39,0,0,0
,0,0,36,86,20,8D,83
1180 DATA 32,39,1,7F,B,2
F,39,36,86,2,B7,B,2F,32,
39,1,1,1,1,59,2B
1190 DATA B,E8,0,0,12,2,
46,13,DE,DC,2,6F,DE,84,4
3,C0,C0,C0,4,C0,41
1200 DATA 20,C0,C0,5,A,F
,22,F,31,C,0,D,0,B,5,B,1
F,D,6C,0,0
1210 DATA 0,0,2,A,4E,4F,
50,4C,53,52,41,53,4C,54,
41,50,54,50,41,49,4E
1220 DATA 58,44,45,58,43
,4C,56,53,45,56,43,4C,43
,53,45,43,43,4C,49,53,45
1230 DATA 49,53,42,41,43
,42,41,54,41,42,54,42,41
,58,44,58,44,41,41,53,4C
1240 DATA 50,41,42,41,42
,52,41,42,52,4E,42,48,49
,42,4C,53,42,43,43,42,43
1250 DATA 53,42,4E,45,42
,45,51,42,56,43,42,56,53
,42,50,4C,42,4D,49,42,47
1260 DATA 45,42,4C,54,42
,47,54,42,4C,45,54,53,58
,49,4E,53,50,55,4C,44,45
1270 DATA 53,54,58,53,50
,53,48,52,54,53,41,42,58
,52,54,49,4D,55,4C,57,41
1280 DATA 49,53,57,49,4E
,45,47,43,4F,4D,52,4F,52
,41,53,52,52,4F,4C,44,45
1290 DATA 43,49,4E,43,54
,53,54,43,4C,52,41,49,4D
,4F,49,4D,45,49,4D,54,49
1300 DATA 4D,4A,4D,50,53
,55,42,43,4D,50,53,42,43
,41,4E,44,42,49,54,4C,44
1310 DATA 41,53,54,41,45
,4F,52,41,44,43,4F,52,41
,41,44,44,43,50,58,42,53
1320 DATA 52,4A,53,52,4C
,44,53,53,54,53,4C,44,58
,53,54,58,2A,2A,2A,0,0
1330 DATA 0,0,0,0,0,0,0,
0,51,1,0,1,51,1,51,1,1,4
1,2,41,3
1340 DATA 1,4,1,5,1,6,1,
7,1,8,1,9,1,A,1,B,1,C,1,
D,1
1350 DATA E,1,51,1,51,1,
51,1,51,1,F,1,10,1,11,1,
12,1,13,1,14
1360 DATA 1,51,1,51,1,51
,1,51,1,15,82,16,82,17,8
2,18,82,19,82,1A,82
1370 DATA 1B,82,1C,82,1D
,82,1E,82,1F,82,20,82,21
,82,22,82,23,82,24,82,25
1380 DATA 1,26,1,27,21,2
7,31,28,1,29,1,2A,21,2A,
31,27,51,2B,1,2C,1
1390 DATA 2D,1,2A,51,2E,
1,2F,1,30,1,31,21,51,1,5
1,1,32,21,1,21,51
1400 DATA 1,33,21,34,21,
2,21,35,21,36,21,51,1,37
,21,38,21,51,1,39,21
1410 DATA 31,31,51,1,51,
1,32,31,1,31,51,1,33,31,
34,31,2,31,35,31,36
1420 DATA 31,51,1,37,31,
38,31,51,1,39,31,31,E,3A
,F,3B,F,32,E,1,E
1430 DATA 3C,F,33,E,34,E
,2,E,35,E,36,E,3D,F,37,E
,38,E,3E,E,39
1440 DATA E,31,3,3A,B,3B
,B,32,3,1,3,3C,B,33,3,34
,3,2,3,35,3
1450 DATA 36,3,3D,B,37,3
,38,3,3E,3,39,3,3F,26,40
,26,41,26,3F,47,42
1460 DATA 26,43,0,44,26,
51,1,46,26,47,26,48,26,4
9,26,4A,7,4B,82,4D,7
1470 DATA 51,1,3F,2A,40,
2A,41,2A,3F,4A,42,2A,43,
2A,44,2A,45,2A,46,2A,47
1480 DATA 2A,48,2A,49,2A
,4A,A,4C,A,4D,A,4E,A,3F,
2E,40,2E,41,2E,3F,4E
1490 DATA 42,2E,43,2E,44
,2E,45,2E,46,2E,47,2E,48
,2E,49,2E,4A,E,4C,E,4D
1500 DATA E,4E,E,3F,23,4
0,23,41,23,3F,43,42,23,4
3,23,44,23,45,23,46,23
1510 DATA 47,23,48,23,49
,23,4A,3,4C,3,4D,3,4E,3,
3F,36,40,36,41,36,49
1520 DATA 47,42,36,43,36
,44,36,51,1,46,36,47,36,
48,36,49,36,44,47,51,1
1530 DATA 4F,7,51,1,3F,3
A,40,3A,41,3A,49,4A,42,3
A,43,3A,44,3A,45,3A,46
1540 DATA 3A,47,3A,48,3A
,49,3A,44,4A,45,4A,4F,A,
50,A,3F,3E,40,3E,41,3E
1550 DATA 49,4E,42,3E,43
,3E,44,3E,45,3E,46,3E,47
,3E,48,3E,49,3E,44,4E,45
1560 DATA 4E,4F,E,50,E,3
F,33,40,33,41,33,49,43,4
2,33,43,33,44,33,45,33
1570 DATA 46,33,47,33,48
,33,49,33,44,43,45,43,4F
,3,50,3,8E,B,EF,8D,0
1580 DATA 38,18,83,3,5,F
D,B,F0,C3,1,0,FD,B,F2,86
,3F,BD,B,C4,1,1
1590 DATA 1,1,1,1,1,1,1,
1,1,1,1,1,1,86,D,BD,B,40
,86,A,BD
1600 DATA B,40,FE,B,F4,B
D,B,A9,BD,B,B8,A6,0,8,FF
,B,F4,BD,B,9A,BD
1610 DATA B,B8,C6,2,3D,F
3,B,F2,18,FF,B,F8,A6,0,C
6,3,3D,F3,B,F0,18
1620 DATA C6,3,A6,0,8,BD
,B,40,5A,26,F7,BD,B,B8,F
E,B,F8,A6,1,36,C6
1630 DATA 20,84,70,27,13
,C6,41,81,20,27,D,5C,81,
30,27,8,C6,44,81,40,27
1640 DATA 2,C6,58,17,BD,
B,40,BD,B,B8,32,36,84,C,
C6,20,4D,27,D,C6,23
1650 DATA 81,4,27,7,5C,8
1,8,27,2,C6,58,17,BD,B,4
0,FE,B,F4,32,81,80
1660 DATA 24,2C,84,3,16,
5A,27,8,A6,0,BD,B,9A,8,2
0,F5,FF,B,F4,BC,B
1670 DATA F6,22,9,FC,B,F
0,C3,3,22,18,6E,5,86,D,B
D,B,40,86,A,BD,B
1680 DATA 40,7E,B,54,E6,
0,8,FF,B,F4,F7,B,F9,4F,5
D,2A,1,4A,B7,B,F8
1690 DATA 18,F3,B,F8,18,
BD,B,A9,FE,B,F4,20,C4,1,
1,1,1,1,1,1
```

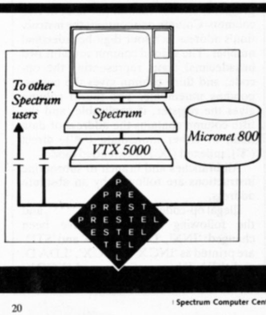
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Stephen Shaw details the pleasures and pitfalls of making your TI programs rewrite themselves.

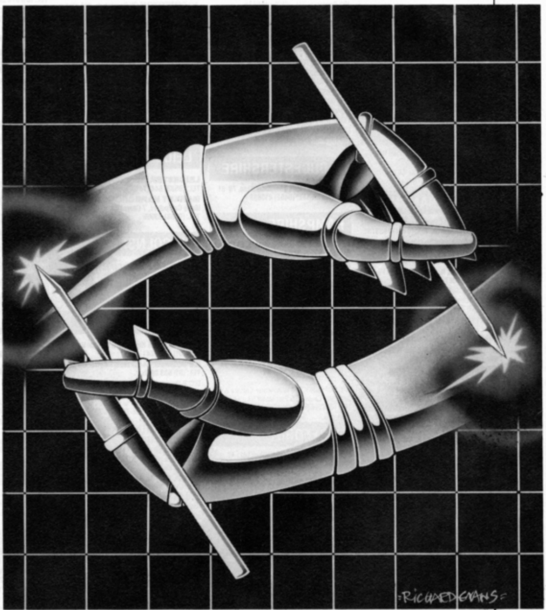
Self-writing TI

The idea of a program which can change itself is not particularly new . . . in fact, it is one of the oldest concepts around.

However, it has never been exploited to any major extent, largely because the received wisdom in the industry is that self-modifying programs are a bad thing. Lest this should sound autocratic, we should add that there's a very good reason.

Ordinary common-or-garden non-modifying programs are hard even for the original author to follow or modify. Imagine trying to follow one which changes every time you look at it!

So, enjoy the idea, use it to do some clever tricks, but take care not to include the technique in any programs which you expect to use for a long time and don't wish to be endlessly modifying.



Richard Evans

When either the Mini Memory Module or the Extended Basic Module plus 32K Extended Memory are used, it is possible for TI99/4A owners to examine the storage of their programs in the computer's memory.

The TI99/4A stores program lines on a stack principle. As each line is entered, regardless of its line number, it is placed at the top of the stack. When a program line is edited, the old line is removed, the stack is adjusted, and the new line added to the top, hence the delay before the cursor reappears. The computer is changing the memory locations of every line above the edited line, and changing the line index which it uses to point to the lines, and which is stored at the very top of the program stack in line number order.

If no disk controller is attached, users may find their TI Basic programs in VDP RAM. The first line entered will end at address 16383, and each subsequent line entered will end at a lower address.

With Extended Basic and 32K RAM, programs are stored from CPU RAM address −25, each subsequent line having a more negative address. A handful of Extended Basic Version 100 modules have been sold in the UK. With these, programs start from CPU address 0 (zero).

Programs are stored in coded format, with single byte codes for the command words, using ASCII codes 129 to 254. This is why users may not define 255 characters. Internally an offset is used to make ASCII 32 (space) appear to be a code 0, and ASCII 159 appear to be a code 127, for screen printing purposes.

In program storage the offset is not used and characters appear as having their proper coding.

Enter this program, in this order:

```
100 REM PCN
110 A=B+2
120 C$=D$&"E"
```

In Extended Basic, in command mode, enter the following line (NB: no line number!):

```
FOR T=-25 TO -51 STEP -1 :: CALL
    PEEK(T,A) ::
PRINT T;A;CHR$(A) :: NEXT T
```

When you press ENTER the computer will display the short three line program by showing the memory location, the value in that location, and the equivalent character (if appropriate).

Without 32K RAM the program is stored in VDP RAM and Extended Basic does not allow you access to this area of memory.

With mini memory, the command mode section must be added to the program, using locations from 16383 to 16356. Note that in TI Basic the storage format is slightly different, although the same codes are used. eg in TI Basic a space is inserted on both sides of the REM PCN. For mini memory, use PEEKV instead of PEEK.

A list of the command codes is given in figure I. They are fairly straightforward, except the way in which fixed values are stored. NUMBERS and UNQUOTED STRINGS are identified by code 200. This is followed by the number of digits or characters involved, and then the number or the characters themselves.

An example of an unquoted string is the name given to a subprogram. CALL COLOR for instance uses one byte for CALL but COLOR takes up 7 bytes — 5 for the word and one each to identify the unquoted string and to indicate its length. This is why you cannot use CALL SUB$: SUB$ is a quoted string. Quoted strings are identified by code 199, and follow the same format — one byte is used for the length of the string.

LINE NUMBERS when they appear in a program (eg GOTO 123) are identified by code 201, and the actual line number then takes up just two bytes, whatever number it is. If the first byte is A and the second byte is B, the line number is:

25 ▶

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LINE NUMBER = A times 255 plus B
Byte B has a maximum value of 127, and byte A a maximum value of 255, giving a maximum line number of 32767.

It is possible by entering short programs such as the above to obtain a good understanding of how the computer stores its programs.

As you have the capacity to change the contents of CPU RAM with Extended Basic (CALL LOAD) or VDP RAM with Mini Memory (POKEV), it becomes possible for a program to almost completely rewrite itself.

In Extended Basic, add to the short program above the following line:

```
130 CALL INIT :: CALL
    LOAD(-28,77,65,71)
```

Before you RUN the amended program, LIST it. Now ENTER RUN and LIST again. Notice any change?

When changing a line in a program in this manner, there are two important precautions:

1. The line, and any lines below it in the program stack, must not be edited. Otherwise when you change the contents of memory locations, you won't be changing the line you thought you were! It is possible to look up the line's memory location in the line index before the program rewrites the line, but it is much easier to ensure that the line(s) to be rewritten are at the bottom of the stack. If only one line is to be edited, enter it first with a middle value line number:

```
10000 REM PCN
```

Now you may enter lines on either side, and edit them, and the location of that line will not alter. You may also RESEQUENCE without causing any problems.

2. The length of the line is the first byte in the line, and it is probably not possible to rewrite a line with a different length.

In Extended Basic this is not too much of a problem: the initial line can terminate with a tail REM (!) and a long false REM. When rewritten you merely ensure that the overwriting terminates with a tail REM (code 131) and a space (code 32), then the rest of the line remains as a dummy REM.

In TI Basic it is usually necessary to keep the line length the same, but some commands do permit dummy endings. This is a matter for experimentation.

What use is this facility? I have programs in TI Basic and Extended Basic which permit pseudo high resolution pictures to be drawn by redefining characters. When completed the computer scans the screen and rewrites the program by dumping the definitions and positions of the characters to defining lines. When the overwritten program is re-run, the sketch appears quite quickly.

Another use is to create commands TI do not give you. A popular use is to enable a generalised disk directory to be added to each disk. When Extended Basic is selected, the automatic directory, on the disk as LOAD, is loaded and RUN automatically.

It then reads the disk index and presents you with a menu. The menu selection is then automatically run. Extended Basic will permit the program line:

```
100 RUN "DSK1.GAME"
```

but not:

```
100 RUN "DSK1."&A$
```

There seems to be no reason for this not to be accepted, except that it gives an error message SYNTAX ERROR.

Therefore the rewrite facility is used to CALL LOAD the required line into memory, one byte at a time, so that the computer sees the line as RUN "DSK1.GAME", exactly as it wants to see it. In this case, because the disk file names are not of fixed length, a value of zero was placed in the unused dummy line positions. Zero marks end of line and prevents crashes.

It is possible with this facility to insert your own (if limited) VAL function, to permit for example the INPUT of a fraction in the form 3/4. First you need a dummy line:

```
10000 A=AAAAAAAAAA+AAAAA.
      AAAAA+AAAAAAAAAA
```

If this is the first line input it is fairly simple to find the locations of each character in the line, as they are stored in memory.

Your input will be to a string variable:

```
INPUT "FRACTION":A$
```

then you must split this up into its three parts and place them into the DEF line.

Use a loop and SEG$ to determine the location of the oblique '/'. This will enable you to determine each part of the string.

Following the equal sign in the DEF statement you will need code 200, then a value equal to the number of digits in the first number (use LEN and SEG$). Then place the number using the ASCII codes for each digit. Then follows code 196 (/), code 200, and the length of the second number, then the digits in ASCII code. Finally, so that the excess AAA's have no effect, in Extended Basic load the codes 131 and 32, or in TI Basic load the codes 193 (+) and two 65's (A). Provided your program does not use variables made up of several AAA's, these have a zero value and no effect. To quickly see a final result, clear your computer and enter:

```
1000 A=45/788+AA+AAAAAA+
     AAAAA
```

Now see how that is stored, using the methods described above.

After you have entered your fraction, and CALL LOADed (or POKEV'd) it into memory, you may refer to the fraction in your program by GOSUBing to 1000 to set the value of A.

If the line is to be used more than once, it should be restored to its original state between each use, by CALL LOADing the original values.

The ability to change a program in this way opens a powerful and useful door for TI99/4A owners, who are no longer quite as limited as they may have thought.

It is possible for a 13K program to almost completely overwrite itself — only the last line needs to be unaltered, to prevent a crash during overwriting.

Note the use of CALL LOAD above. You may load a line fully with only one command, and in the correct order. When using Mini Memory CALL INIT is not used.

Figure 1

129 ELSE	161 SUB	193 +	225 RPT$
130 ::	162 DISPLAY	194 – (MINUS)	226 NK
131 ! (TAIL REM)	163 IMAGE	195 *	227 NK
132 IF	164 ACCEPT	196 /	228 NK
133 GO	165 ERROR	197 ^	229 NK
134 GOTO	166 WARNING	198 NK	230 NK
135 GOSUB	167 SUBEXIT	199 STRING MARKER	231 NK
136 RETURN	168 SUBEND	200 UNQUOTED STRING	232 NUMERIC
137 DEF	169 RUN	201 LINE NUMBER	233 DIGIT
138 DIM	170 LINPUT	202 EOF	234 UALPHA
139 END	171 NK	203 ABS	235 SIZE
140 FOR	172 NK	204 ATN	236 ALL
141 LET	173 NK	205 COS	237 USING
142 BREAK	174 NK	206 EXP	238 BEEP
143 UNBREAK	175 NK	207 INT	239 ERASE
144 TRACE	176 THEN	208 LOG	240 AT
145 UNTRACE	177 TO	209 SGN	241 BASE
146 INPUT	178 STEP	210 SIN	242 NK
147 DATA	179 , (COMMA)	211 SQR	243 VARIABLE
148 RESTORE	180 ; (SEMI COLON)	212 TAN	244 RELATIVE
149 RANDOMIZE	181 : (COLON)	213 LEN	245 INTERNAL
150 NEXT	182)	214 CHR$	246 SEQUENTIAL
151 READ	183 (	215 RND	247 OUTPUT
152 STOP	184 &	216 SEG$	248 UPDATE
153 DELETE	185 NK	217 POS	249 APPEND
154 REM	186 OR	218 VAL	250 FIXED
155 ON	187 AND	219 STR$	251 PERMANENT
156 PRINT	188 XOR	220 ASC	252 TAB
157 CALL	189 NOT	221 PI	253 # (WITH FILES)
158 option	190 =	222 REC	254 VALIDATE
159 OPEN	191 <	223 MAX	
160 CLOSE	192 >	224 MIN	

- **Many codes are not accepted by the TI Basic interpreter.**
- **Some codes (marked NK) are not accepted in Extended Basic.**
- **Codes may be used slightly differently by TI Basic to Extended Basic. The computer adjusts storage format if a program saved in TI Basic is loaded with Extended Basic and vv.**

After having played with Portico's portable Z80 computer, Max Phillips seems to believe in miracles.

An immaculate conception?

The Portico Miracle may seem a little like a hopeful latecomer. Portico is a new British company and the Miracle seems to be a rather old-fashioned Osborne-like machine. But this particular Z80, CP/M plus free software in a portable box offering is a little bit special.

The Miracle is a comfortable machine to work with. A 10 inch screen and 368K floppies make it more luxurious (and heavy!) than an Osborne. A 64K disk cache memory provides a dramatic performance. And a price tag of £1,795 isn't ridiculous.

Presentation

The Miracle presents itself a little better than its advertisements. It arrived in a smart black shoulder bag plus the usual plastic bag of manuals.

A simple but welcome touch is a freebie Super de-luxe disk library. These folders provide a safe way to transport and organise up to 16 disks each.

The Miracle's looks have been well thought out. It's aimed at executives and, though not a toy, is definitely designed to grace their desks.

When in use it sits flat on the desk. The user looks down on its slightly angled screen so conversations across the desk are not impaired by the machine. And a sliding hatch over the interfaces keeps the back of the machine as tidy as possible.

Documentation

This seems to be a typical British let down although the British habit is to gradually improve the standards of manuals. You get a systems manual and a software manual, both daisywheeled A4 spiral bound books.

The first deals with the Miracle and its system software. There's a hopelessly brief introduction to CP/M and a short look at the 'Guide' front end package. The transfer utility, disk cache software and built-in monitor are also described.

Finally, there's a wealth of extremely welcome technical information — pin outs, terminal sequences, memory maps, character sets, conversion tables and so on. Unfortunately, they won't do much for your average business user who will be looking in vain for a 'getting started' section.

The second manual deals with three of the five supplied applications programs, the Chang labs suite Memoplan, Fileplan and Profitplan. The IANKEY typing tutor doesn't seem to qualify for a manual and Micromodeller comes as a complete package with its own manual.

The documentation is a slightly condensed version of Chang's own manuals, themselves not renowned for their helpfulness. Like the systems manual, the information tends to be plain reference. It's up to the user to have the sense and courage (and preferably experience) to try and work the thing. In my own case, I needed to borrow a copy of a full Chang manual simply to find out how to print headings at the top of each Memoplan page. Worrying to say the least.

The Miracle is very much a dealer machine, one that is designed to be demonstrated to customers, have its users trained and, of course, problems can always be cured with a phone call. There's nothing wrong with that, business machines should have this level of support. The Miracle is actually a lot easier to use than many of its rivals. However, a little more effort on the manuals will save users and dealers a lot of wasted time.

> **'A system which outperforms a great many of its rivals'**

Construction

The Miracle is a very solid 28lbs of computers. In anyone's terms it's heavy, more so than any number of desktops. Portico may in time reduce the weight but current policy is to keep the machine as solid as possible.

With a system like this, portability is a sideline. It is a one box system that can be moved with a car at weekends or between offices at lunchtime. The shoulder bag does make it possible to carry and it is no harder than shifting an Osborne.

One last point on portability. Osborne established a joke about a computer that could fit under an airline seat. It may be a while before I get to test that with a Miracle. But it is really difficult to fit it between the seats on the bus home.

The Miracle is cooled by a fan — not obtrusive but loud enough to let you know it's there. Inside, the computer is based on the Radar 150 board, Pro-Tested in *PCN* issue 20.

The system is a Z80 with 64K RAM plus an extra 64K RAM for the disk cache memory. Current options include a 192K cache memory and there are five slots available for future hardware. Portico is already considering a 16 bit upgrade. This upgrade will be an 8086 cord and is planned for October.

The structual foam case is square and cumbersome though it does give the machine a sort of classical look. The keyboard hooks onto the main unit covering the screen and disk drives.

The lack of any handles is a real surprise. The machine may have desktop presentations but you do need to be able to move it around. Even two hand-holds knocked in the side would have done.

Keyboard

The keyboard is a separate 86 key unit with a pleasant feel. It has a full complement of keys — numeric pad, cursor cluster and ten function keys. The qwerty section has an 'original' layout, the most disturbing feature being the positioning of @/, ¦¯ and < > between the home keys and RETURN.

From an ergonomic point of view, the keyboard appears to be far too flat. Portico may be trying to encourage the strange habit of typing with a keyboard on your knee.

Visions of non-typing executives, feet on desk, one finger anxiously searching for the key marked RTN. For most people, I suspect the classic Miracle stance to involve two paperback books, or perhaps a rolled up *PCN*, shoved under the keyboard.

A Reset key is provided and this sensibly needs the combination SHIFT-RESET-RESET to actually reset the machine. The function keys can be simply programmed using the SETKEYS utility.

It's a shame that the whole keyboard isn't so easily reprogrammed. For a start, the left arrow does a backspace and delete in CP/M. The DEL key does the rather more useless delete and echo. Again, inconsistent with the applications programs.

The other wonderful trick is that pressing the Escape key six times on the trot lands you in the Miracle's monitor



Top: The Miracle is a good looking all-in-one unit weighing 28lbs. Right: A shoulder bag is provided to allow you to carry the otherwise immobile machine.

program. The monitor I love, but the way of getting there seems to be out of the Wizard of Oz — you know, click your heels together and twirl round three times . . .

I discovered this by accident. I was in the user friendly Guide and it had told me on at least one occasion to press Escape to go back to the main menu. I did and it didn't. I pressed Escape again. No luck. On the sixth try, magic! Back in the monitor.

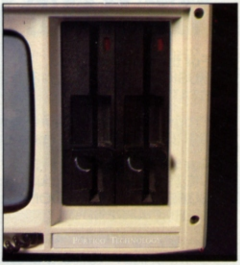
It had to be a bug. It took a while to convince myself that six presses of Escape really did drop you out of any application program. It is crazy to give such a common interrupt key such drastic powers.



Screen

The Miracle has a built-in 10-inch green monitor making it perfectly possible touse the system for long periods of time. Your only control is a brightness knob on the front left of the case. The quality was perfectly adequate though focus may have been a touch soft and the screen has no anti-glare coating.

It is a standard 80 column by 25 line display with two possible text attributes, inverse and dim so you've got a standard and adequate display. But the Miracle has only 128 block graphic characters. Even deadly serious business users are begin-



Top: The Miracle's 386K disk drives. Below: External controls are for brightness and on/off



ning to see the need for graphic displays. Again, it seems odd to have launched a machine without them.

Storage

The Miracle comes with two 386K byte floppies (Portico quotes 400K and 500K elsewhere — 386K is what you actually get to use). The drives work perfectly and have a couple of very special features — intelligence and a 64K cache memory. Neither is unique but both are very nicely implemented.

The drives can sense when a disk has been changed and automatically log in new disks. To experienced CP/M hacks, that means never having to type Control-C. To more usual users, it makes it less easy to make dangerous mistakes. The intelligence is very welcome, especially since it couples with the disk naming and logging provided by 'The Guide'.

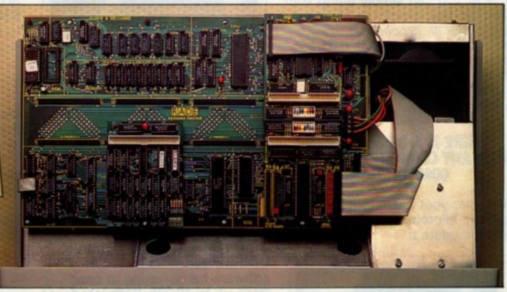
The other feature is the cache memory controlled by a program called CACHE .COM. This is auto-run as standard when you boot the Miracle.

The extra 64K memory is used as a buffer between the real memory and the disk. The Cache stores data that is frequently being requested by the computer, such as directory information. When the computer next asks for the information, it is available almost instantly rather than having to come off the disk.

The system is surprisingly intelligent. 30 ▶







Above: The Miracle's well specified keyboard. Right: Inside, Rade's Z80 board doing all the work

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Sectors of the disk that haven't been asked for for a while are ejected from the cache to make room for ner information. All disk writes go immediatly to the actual disk for security reasons, though only those sectors that have been changed are actually written.

All this is invisible to the user. All he gets to see is a system which is outperforming a great many of its rivals. The system particularly succeeds with programs that use a lot of overlays (such as Wordstar) where the frequent swopping into memory of bits of program happens so much quicker.

For those that understand the cache system, two utilities LOCK and UNLOCK add to its usefulness. These fix certain files into the cache memory, effectively letting you use it as a primitive RAM disk.

Just like 'intelligent' disk drives, a cache memory isn't a unique idea. But it is done well on the Miracle and certainly enhances its performance. When hard disk Miracles emerge (probably with 3½ inch Rodimes), the cache can be extended to 192K to cope. The success of the cache system as demonstrated here is yet another good example of why it should become standard issue on new machines.

Interfaces

The Miracle has the standard range of interfacing you'd expect on a business machine — two RS232 ports and a Centronics port. These live in the hatch at the back of the machine along with its mains cable.

The ports are delightfully sited on the end of ribbon cables. Portico keeps its clean machine look yet you can still reach over and plug something in without having to turn the machine round. It's a great idea but an extra couple of inches of cable would have helped.

There's plenty of room for further options to be added. An RS422 interface, for a network system, is already on the cards. And all manner of things could easily be added.

Software

The Portico puts itself firmly in the Osborne class by coming with a heap of free software. There's CP/M with its standard utilities including the assembler system — ASM, DDT, ED *et al*. The normal user can avoid CP/M in total by using Decision System's 'The Guide', a user friendly front end. The Chang labs' suite is Memoplan (a word processor), Fileplan (a file handler) and Profitplan (a spreadsheet). Iansyst's IANKEY provides a typing tutor.

Finally, you get a copy of the top financial planning package Micromodeller. This seems to be a cunning bit of vertical market thinking. As a Micromodeller machine, the Miracle is going to

have special appeal to a large number of its intended customers.

A word about the Miracle's machine code monitor. It's a pleasure to see such a program in a new business machine. The monitor is a dead simple affair. It lets you dump and alter memory, reset the machine, or start the Z80 off at a particular location.

It won't be of much use as a programming tool (you've got DDT for that) but it has a number of uses on a standard CP/M system.

The most obvious is restarting a program is memory. Many CP/M programs are loaded from disk as they are needed. The moment the command finishes, it is left lying around in memory. Try the command and again and CP/M loads it again.

'The software incorporates some pretty advanced and clever ideas'

Now it doesn't really matter on the Miracle because the command will just be copied straight out of the cache memory. But on a normal system, it would take ages. On the Miracle, press Escape six times and G100 from the monitor to restart the program where it lies.

All sorts of crashes and patches can be made and recovered using the monitor and there's never any problem getting stuck in it. G RETURN will warm start CP/M and put you straight back in the system.

Meanwhile back in the land of the naïve user, the Miracle puts on a brave face using 'The Guide' from Decision Systems. This is a complete front-end system that hides CP/M away and provides a simple step-by-step way to run your machine. The Guide is a very impressive program. It looks after your disks, giving them names, telling you when you need to make new copies and even where you can buy new disks.

It keeps track of everything. Ask for the typing tutor and it tells you to pop your IANKEY disk in to the left hand disk drive and so on. It provides copious disk information and management facilities and can be expanded and maintained to look after new programs as you buy them. However, it works in a slow but sure way. There are no shortcuts.

The Guide rapidly becomes too long winded and cumbersome. Everything is verified. What do you want to do? You key a number. Do you want to do such and such? You answer yes or no. Such and such — press RETURN to continue. And so on. It isn't even consistent; the RETURN key is sometimes necessary, others not. The Escape occasionally returns you to a main menu.

The big joke occurs towards the end of the eight odd questions needed to produce a list of files on the disk. You have to use a CP/M ambiguous file spec to select the files you want to look at. The idea is to avoid learning CP/M.

Incidentally, eight questions is a lot to go through to look at a disk. In CP/M you have to learn to type the command DIR (for directory). It's even funnier on the Miracle. Boot its standard CP/M master and you can look at a list of disk files by pressing the key marked F1.

You could, of course, add facilities to look at the disk directory in a simple way straight from The Guide's main menu. It is a very versatile program. You could do all sorts of things. But you would need to know CP/M first.

Again, reactions are mixed on Memoplan, Fileplan and Profitplan. The programs have some clever and unique features — the word processor (Memoplan) for example can handle up to seven documents at once. You can skip between them at will. It is useful for preparing memos and reports.

Memoplan is also one of the safest word processors about. Pause for a moment and it stores all your work on disk. It is like a jotter, your writing stays on it until you explicitly write it to a CP/M file and wipe it from the pad. Even pulling the plug usually won't damage the text. So the software incorporates some pretty advanced and clever ideas.

Fileplan isn't really a database. It is a clever little indexing system — great for handling lists and I suspect more use on the average desk than some great monolithic relational database.

The trouble with these Chang labs programs is that the good ideas just don't go all the way through. The documentation has been mentioned and the user interfaces are in a similar state. They aren't even consistent across the three package.

Programs which could be easy to operate involve long sequences of control codes. And simple things like printing page headings on Memoplan turn out to involve long and complex CP/M level commands. And the programs seem to have silly limits. Try double spacing on Memoplan. Maybe it can be done but there doesn't seem to be a simple way. As for the error messages, my favourite was 'Field out of range: Call your dealer'. I hope that's somebody's private joke that will be removed from the next release.

In short, it will take some effort to get used to the Chang labs software. And when you do, you may find yourself moving on to more well known packages such as Wordstar and Multiplan.

Both Iankey and Micromodeller are less important. Iankey because it is a 'throw-away' extra, albeit a valuable and effective package. Micromodeller because it appeals to the more specialist user who will know the package and be looking at the Miracle only as a vehicle to run it.

The Miracle's software is more complete than many. It does lack a high level language included in the price. Of course, you don't need one on a business system but it still seems to be something of an omission.

The Guide provides a far better introduction to computing than the raw 'A>' that faces a newcomer who gets landed with learning CP/M. The Chang labs software makes the Miracle a good general purpose tool, though I suspect many will move onto more popular packages.

Conclusion

The Miracle is something of a pleasant surprise. It seems a sensible system with a clever hardware design and enough free software to put it into the value-for-money stakes.

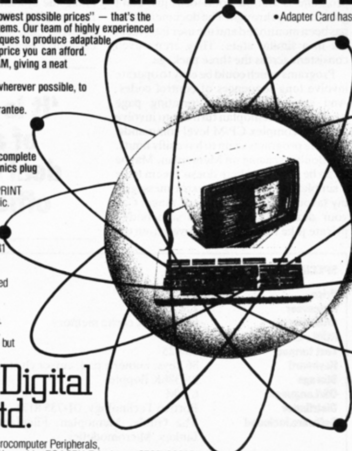
It isn't the most advanced business system, but nonetheless is capable of a great deal of useful work around the office. Being 'old fashioned' also means having a well known and reliable design. Probably the most important aspect of the system is the level of support which Portico and its dealers intend to offer.

You might well consider the Miracle alongside systems like the Osborne, and Epson QX10. The choice is very much a personal one, and the Miracle's 'touch of class' may weigh heavily in its favour.

'It is capable of a great deal of useful office work'

SPECIFICATION

Price	£1,795
Processor	Z80, 4MHz
RAM memory	64K + 64K cache memory
ROM memory	4K
Text format	80×25
Keyboard	86 keys, numeric pad, cursor cluster, 10 function keys
Storage	2×386K floppies
OS/Language	CP/M
Distributor	Portico Technology, 01-735 8171
Software included	The Guide, Memoplan, Fileplan, Profitplan, Transfer, Iankey, Micromodeller



It has finally arrived . . . Brian Cadge test drives the new Dragon disk drive and gives his approval.

Drive your Dragon

Six months later, Dragon's official disk drives have finally arrived. As promised, the cost is £275 for a single sided, double density drive and controller. This is about £25 cheaper than the norm, but still £100 more than the Dragon 32 itself.

The review drive arrived with disk controller, connecting lead, power lead and preliminary manual, but no disks. Setting it all up is easy. The power supply is built-in, explaining why the case is somewhat long at 14in, but this doesn't seem to cause any serious overheating, even during prolonged use, as the coated steel case is well ventilated.

The disk controller and DOS (Disk Operating System) are in the form of an elongated cartridge connected to the drive by an 18in ribbon cable. The whole set-up looks very neat, except the controller cartridge, which protrudes 4in out of the side of the Dragon — preventing the drive from fitting snuggly next to the computer.

The disk drive itself measures 14 × 6 × 4.5in and has room for two drives. The top half has a plastic shield covering the gap for a second drive unit. It's a fairly standard set up — 5¼in, 40 tracks, 18 sectors per track, each sector holding 256 bytes. This gives 180K when formatted, but only 171K is available after the DOS has set up its directory tracks. A small red LED shows when a disk is in use, but there is nothing to warn you that you must not insert or remove a disk while this is lit.

With the drive connected and the power turned on, the most noticeable point was that the display quality on the TV had deteriorated even further — fiddling with the aerial cable and moving the drive further away reduced the interference, but it was still noticeable. The usual sign-on message appears, then the screen clears and it announces DRAGONDOS 1.0.

New functions

The cartridge program is not a completely new Basic; it simply adds commands to the existing one by altering the system variables at power up. In addition to the 26 disk operating commands, nine new Microsoft functions have been added to enhance the Basic. (*See table 1, page 34*).

Typing AUTO L,I produces line numbers automatically, starting at line L in increments of I. This is an extremely useful function when typing long programs in, and speeds up entry by 20 per cent. Error handling has been improved by ERROR GOTO n, which causes the program to jump to line n if an error occurs.

ERR will give the number of the last error code, and ERL will give the line at which it occurred. Many new error messages are added by the disk system, but they still stick to the silly two letter code method which is difficult to remember because there are so many. Some codes are even repeated — FD can mean Faulty Data *or* Directory Full!

Every error code from 0 to 166 is listed at the end of the manual. This is the only place I can really fault it — the messages are not explained, for example, CC means Cyclic Redundancy Error, but it is not mentioned anywhere else in the book, and could cause real headaches to people trying to work out what it means. Some codes, *eg* UF, have absolutly no explanation. UF Error is error 34, but what does it mean? In fact it means Undefined Function, but you won't find it in the manual.

To be fair, this is only a preliminary version of the manual, with the usual errata sheet included.

BEEP is a new command which the manual describes as giving 'An acceptable-sounding Beep'. It is certainly different from that given by the sound command, but whether it warrants a whole new command is doubful. WAIT n will pause the program for n milliseconds, and SWAP x,y if another very useful function which swaps the values of x and y, without going all through A=X:X=Y:=A.

Disk commands

Moving onto the disk commands, these are generally well documented, although a quick-reference card like the one for Basic, or even an index to the manual would have been nice. The disk controller can handle up to four drives, single or double sided, 80 or 40 tracks, which means just about any 5¼in drive can be configured with it. If you want the controller cartridge on its own to set up with your own drives, this will cost you £50.

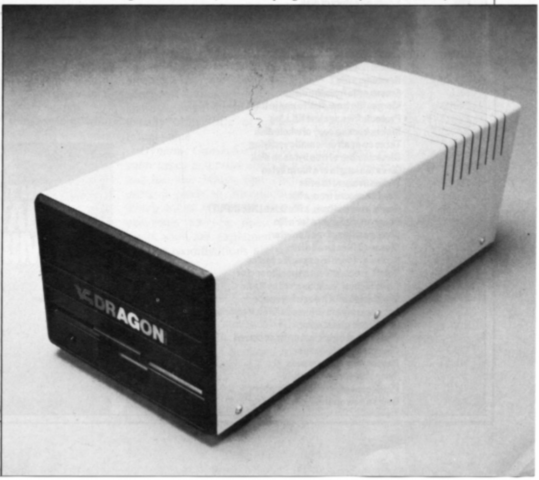
The formatting command is DSKINIT. Typing just this assumes a single Dragon drive, and you can type DSKINIT drive, sides, tracks for setting up your own type of drive. A disk must be formatted first in order to set up the tracks and directory. This only needs to be done once to a disk unless you want to erase the whole thing.

BACKUP is a useful command which backs up a complete disk to another one. If you only have one drive, the Dragon tells you when to insert the source disk and when to insert the destination disk. Many swaps are necessary, depending on how full the disk is, and it takes some time to complete — sore fingers result. This command seems to have no protection to lock, so presumably it will be possible to copy any disk, including professional software. This is inviting people to pirate software, but companies will no doubt quickly find a solution to this.

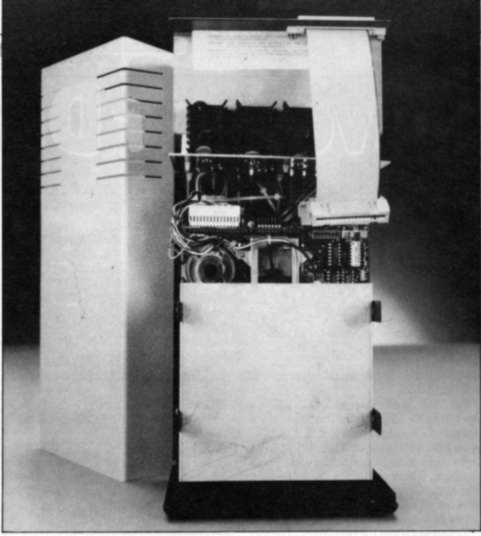
Basic and machine code programs can be saved as they can on the tape recorder, using SAVE instead of CSAVE. The cassette system can still be used, even with the drive connected.

Programs can be reloaded with LOAD or RUN "PROG", which will load and then autorun a Basic program, or CHAIN "PROG",n, which will load and run the program from line n with all variables intact. MERGE has also been added and allows a program on disk to be merged with the program already in the memory.

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◄33



There are also facilities to copy one file to another disk or the same disk, and to rename a file. Files are erased from the disk with the KILL command. To prevent accidentally KILLing a valuable program you can PROTECT it — an inverse 'P' appears in the directory listing next to the program name, and the file cannot be erased. You can remove this with PROTECT OFF.

As well as an eight character filename, a file type specifier of three characters appears in the directory. This is either BAS for Basic programs, BIN for machine code, DAT for data files, or BAK for a backup copy. They appear as PROGNAME.BAS 320, this being the number of bytes on the disk used. At the end of the directory, the number of free bytes available on the disk is shown — this can also be called with the FREE function.

You can also assign your own system of file specifier if you wish.

The file handling is one of the DOS's best features. Up to ten files can be open at once, each one simultaneously for input and output, and they may be accessed as serial or random access files using FREAD, FWRITE and CREATE. I found I could easily transfer a database program from cassette to disk after only a few hours of use, reading in the cassette and restoring it on disk. I then used the random access file as memory, which effectively gives you over 100K of data 'memory'. As access time is so quick — this is one of the fastest 5¼in drives I have seen — you hardly notice the difference from ordinary memory. With a dual disk system, the Dragon is now more than suited to a small business.

You can also create your own file handling, with the ability to write to specific sectors on the disk and read back from them, for true random access. However, you will need a separate disk for the data to avoid the possibility of overwriting programs already stored on the disk itself.

TABLE ONE — List of new commands:

DRIVE n	Selects drive n (1-4)
DSKINIT	Formats disk
DIR	Prints directory of disk
SAVE	Saves Basic or machine code programs
LOAD	Loads Basic or machine code programs
RUN "PROG"	Loads and runs Basic programs
CHAIN	Loads and runs Basic programs with variables intact
COPY	Copies files to another disk or same disk
RENAME	Renames a file
KILL	Erases a file from the disk
MERGE	Merges file from disk to one in RAM
PROTECT	Protects files against KILLing
BACKUP	Makes backup copy of whole disk
VERIFY	Turns on or off automatic verifying
FREE	Gives number of free bytes on disk
LOF	Gives the length of a file in bytes
FWRITE	Writes a record to a file
FREAD	Reads a record from a file
FLREAD	Reads a record from a file (Like LINE INPUT)
CREATE	Reserves disk space for a file
LOC	Gives position of read pointer
CLOSE	Closes all files on all disks
SWRITE	Writes a record to a specific sector
SREAD	Reads a record from a specific sector
HIMEM	Gives highest location used by Basic
FRE$	Gives amount of free string space
ERROR GOTO n	Causes program to jump to line n if error occurs
ERR	Gives code of last error
ERL	Gives line at which last error occurred
BEEP n	Gives n separate beeps
WAIT n	Pauses for n milliseconds
SWAP X, Y	Swaps the values of x and y
AUTO	Produces automatic line numbers
BOOT	Boots a new operating system into RAM

The manual covers almost all file handling briefly but concisely, except for random access files, which are missed out until the errata sheet. As it is unlikely that a newcomer to Basic would have a disk drive anyway, author Alan Mayer has made a fair attempt for a preliminary 58 page manual.

The DOS uses some workspace memory — 1½K, to be exact. This has rather stupidly been put between location 1536 and 3071, *ie* graphics page one. The Basic graphics are not affected — page two is now page one, and so on, but you may have trouble with machine code programs, especially any that load into this area from cassette. These would include all of J Morrison's games (Bonka, Droids etc) and the latest batch from Microdeal (Cuthbert, Morocco Grand Prix etc).

On power up, you have 23,335 bytes free. Most programs will run without changing, but some, especially long adventure games, will no longer fit straight in.

Verdict

Dragon seems to have got it just about right with this disk drive, albeit rather late. The metal case and built in power supply are a great improvement over the Dragon computer itself. The cartridge connection is a little dubious. But I encountered no hardware problems, and there are no obvious bugs in the Basic, and the manual is a fair attempt for a preliminary one.

Just whether you need a disk drive is another matter — £275 is a lot of money if you just want to load games in a couple of seconds. On the other hand, if you have need for mass storage then the cost is certainly worth it, for this is the best of the drives available for the Dragon 32.

Can a light-pen system fulfill your dream? Richard King reckons it's quite on the cards.

Apple lit up

If ever there was an item which shows that the really great inventions never seem to make the headlines, the Gibson LPS II must be it. It's been available for some time now, but surprisingly little excitement has been generated by it.

LPS stands for Light Pen System. The II is because there was a I, but that's where the similarities end. Both are light-pens, but the newer version is vastly more capable.

Presentation

The Gibson LPS II comes packed in an eight-inch disk box, providing maximum protection for the contents. Inside there's a lump of foam, carved out to fit the pen and the card, disk and documentation.

The system-programs are openly declared to be preliminary, as is the documentation. From reports, it appears that Gibson Labs has issued several updates already, with many more to come. The system is expected to be augmented continuously, and the final documentation is to be in the form of a ring-binder, so that new chapters can be added. A very good idea, which it would be good to see used more widely.

Gibson also plans to produce the Penmaster Newsletter to keep users in touch and up to date with developments. With promises like this, the support should be excellent.

As reviewed, the documentation consists of two A5 pamphlets and a couple of notes, which clarify and correct certain points of the installation, particularly for Apple IIe owners. It should be mentioned that the LPS II is supposed to work with the IIe, and in view of the smoothness of the system, I can well believe it. However, it was not actually checked, and there's no mention in the documentation of using it in the IIe Extended High Resolution mode.

In general, the system is well described, and apart from mentioning some unnecessary chip juggling, and a dangerously confusing reference to a jumper on the card, it is adequate. You are told to cut the jumper if you aren't putting the card in Slot 7. DON'T DO IT . . . . the newer cards don't need it.

As supplied, the system is only usable from Applesoft. The &-hook is used to call the Pentrak driver, and so all the explanation refers to this language. A minor problem occurs here if you have an Integer Basic machine, since the boot-procedure will not be the 'PR£6 . . . off you go', but then if you have a machine that old, you'll know all about that.

Construction

The hardware consists of a card which plugs into an Apple expansion connector, to which is wired a thing that looks like a Biro without a refill, on the end of a long wire. This is the lightpen itself. The card carries some essential (and highly original) electronics.

Gibson Labs has taken the unusual step of encapsulating the entire thing in black resin, thus preventing anyone from copying the design.

Installation

According to the instructions, the LPS II is generally meant to reside in Slot 7, which is provided with video signals on the Apple. For owners of IIes, which don't have these signals on Slot 7, and Apple II owners in Britain, who tend to have colour-cards in 7, it is necessary to link up a wire, which is thoughtfully provided with a test-probe on the end. If this is done, the LPS II card can then be put in any slot.

After plugging in the card, the pen cable is led forward so that when the lid is replaced it comes out of the front. I didn't like this since it means that the lid has to bend to accommodate the cable, but it does provide a very adequate method of holding the cable.

Getting started

Getting the system running is so simple and reliable that in contrast practically all other peripherals seem positively heavy handed. All that is necessary is to make sure Applesoft is up, and boot the disk. The driver software (called Pentrak) loads itself into the top of RAM, and then rebuilds the DOS buffers below.

This neat trick, also used by PLE and a few other programs, results in a utility so firmly embedded in the system that almost nothing can touch it, not even hitting RESET, changing language from Applesoft to Integer Basic and back again, or running any number of user-programs.

Of course, powering-down and re-booting DOS will destroy it, but the system can easily be restarted by running the HELLO program.

On booting the Pentrak driver, the &-vector is set, and a whole extra set of commands become valid (see table page 38). Another clever notion in the software is that any previously loaded &-utilities are unaffected, and will run quite normally, even after the Pentrak loader is run.

That's what the manual said, anyway. In practice I found this to be almost true. GPLE seemed to need a CTRL-Y restart before it would work reliably, but I can't deny that it was there.

The system comes up with a menu which uses the pen to select from 12 programs.

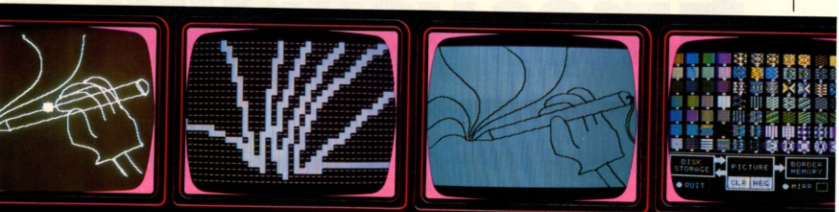
The first thing to do is to calibrate the system, so that the pen is tracked accurately. This is because the position value returned by the pen will depend upon the monitor being used.

Calling up the Calibrate program puts up a series of test-grids, and the performance of the system can be altered until the desired accuracy is reached. The Pentrak driver is saved at the end, providing a final, fast-loading version. If you have more than one monitor, with noticeably different characteristics, you can save several copies.

The manual says that if you find that you have to turn the screen contrast up to an 38▶

What is a Light-pen?

A light-pen is a fast-acting photo-diode on the end of a wire, which is hooked up in such a way that the computer can tell exactly where the pen is pointing by counting the number of Vertical Sync pulses and Horizontal Sync pulses which occur between the start of the screen and the diode being triggered by the raster (the dot that gets flung about to make the image). Using these values, it is then possible to tell what the user wants, and to make the computer respond appropriately.



Draw the picture roughly, not worrying about crossing lines, using Penpainter. Zoom in to fix up the details with Easyedit . . . And get a cleaned-up drawing, which we invert . . . Then back to Penpainter to load the pattern file . . .

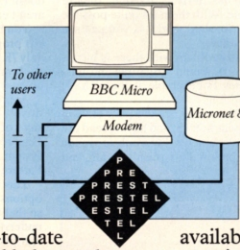


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. . . Border the image . . . And the Info-Flow diagram changes . . . Then we fill in the colours . . . But you can get pretty fancy!

◀35 uncomfortable level, you can remove the end of the pen. I tried everything short of ceremonial decapitation with a scalpel, but I couldn't do it. A tight push-fitting 'snoot' would be a good idea here, since it doesn't look like the pen is replaceable. This detail should be made reversible.

In use

After the calibrated driver has been saved, the main menu reappears again, and you can start to use the pen. Several of the options available are simple demos, which don't really have much to do with the pen, but demonstrate features of the Pentrak driver. There are also some useful programs, which give a tantalising glimpse of the system's capabilities.

These are Penpainter, Pattern Editor, Boxes, Circles, Grid Draw, Geomed, and Easyedit. Although they're a bit rough-edged and not terribly reliable, they're quite usable. With them it's quite possible to put out finished work, as you can see from the pictures.

The main problem with these is inconsistency in command structures and missing facilities. For example, it doesn't have a SAVE option.

It is a pleasure to use the pen. Having used lightpens before, and having read the respective documents, I was only too ready to be disappointed. I wasn't at all, and found myself grinning with idiotic pleasure when my one line programs not only worked, but did quite amazing things.

The Pentrak driver was actually doing the really hard bits, but even so, a dozen or so &-calls in a moderately complicated line doesn't look like it can do much. There aren't enough bytes there, are there?

You bet they can! Look at the (unlocked) programs on the disk. The longest is only 7K, and that does most of the jobs that many multi-thousand pound CAD systems do, and with little loss in resolution.

Apart from the sophistication of the driver, the applications which use it show signs of some very creative minds at work. One result is the Info-Flow(tm) menu-system which is used in Pen-painter, Pattern Editor and Animator.

This shows graphically the available options and the associated data-structures so that the valid operations can be clearly understood by the user. By using the lightpen to point at the chosen operation, a very clean, neat and comprehensible control system has been produced.

Though this system has not as yet been used outside the graphics programs on the disk, I feel that the ideas should be considered by others as useful techniques.

It seems that so many people are so impressed with the Gibson LPS II that many software writers are including the necessary programming to handle it in their systems.

The Addendum says that Woz liked it and bought one on sight, that Apple Computer has several and may well use it in its own software and that Stoneware's GPS Graphics Processing System will soon support it.

Page-setting commands:

TP	Text primary
TS	Text secondary
LP	Lo-Res primary
LS	Lo-Res secondary
HP	Hi-Res primary
HS	Hi-Res secondary
CHP/CHS	Clear Hi-Res primary/secondary
DHP/DHS	Draw Hi-Res primary/secondary

Principal commands:

INIT	*Set default values for Pentrak.*
TRACK (h, v, opt, opt . . .)	*Follow the pen, using the options.*
PEN (h, v, opt, opt . . .)	*Rather like TRACK, but for any screen mode.*
WRITE (h, v, string)	*Just what it says.*
FRAME (×1 TO ×2 AT y1 FOR n)	*Make a window. Old contents can be preserved.*
XLINES (h, v, opt, opt . . .)	*Draw cross-hairs at specified point.*
ZOOM (h, v)	*Copy part of Hi-Res screen to Text Primary.*
CLEANUP	*Try to tidy up the screen (emergencies only)*
START	*Set up the pen for a new job, and go to it.*
CLICK! (pitch, duration)	*Make a beep.*
OFFSET (h, v)	*Return current offset if 0,0. Otherwise set it.*
DOTS	*Fill screen with dots on an 8 × 8 grid.*
SKETCH	*Draw a line wherever the pen goes.*
MIRR n	*Set mirroring for SKETCH. Mind-bending to watch.*
NEG	*Invert colours of current screen.*

Potentially lethal commands which you shouldn't mess with are FIX, SELECT, FILL

Options:

KEY	Go back to Applesoft when a key is struck.
ZV n	Go back to Applesoft if the pen doesn't move for n frames.
LINES (on, off)	Draw crosshairs through cursor, blink at on-off rates.
RT	Makes complicated drawing easier and more reliable.
HLO/VLO	Provide only Horizontal/Vertical crosshairs.
HMO/VMO	Track only Horizonatal/Vertical pen motion, like a T-square.
HTM/VTM	Horizontal/Vertical trigger margin. Used for fancy stuff.
MAP n	Reduce pen-resolution for extra precision. Think about it.
MIXED	Use mixed text and graphics.
NOMIX	Graphics only.
FACE n	Use typeface number n.
NC	No tracking-cursor.

Verdict

Overall, this would seem to be one of those items for which the eventual uses will be so wide that we can't begin to guess them. Certainly the LPS II is so close to being a 'finished artifact' that it must be a worthwhile addition to almost any system.

When the final release software becomes available, the LPS II will be recognised as a classic device, which will open up yet more applications for the Apple.

Product Gibson LPS II **Application** Lightpen system for Apple-bus **Manufacturer** Gibson Laboratories **Supplier** Pete & Pam Computers **Price** £249.95 approx

This Microplot package for the Dragon cuts three ways. David Owen tests it in triplicate.

Three-headed editor

The Dragon 32 is beginning to look a bit more convincing as a business partner these dats (pages 220-221 in last week's Micropaedia summarise the word processing, database and accounts and file-handling software now available). The Editor package from Microplot integrates some of these operations, for as well as being the editor that its name indicates, it also offers limited word processing and database management.

Its £9.95 price-tag makes it seem an economic and convenient proposition. I tested it on a Dragon 32 linked to a Radio Shack DMP200 printer.

Features

Programs or files of up to 360 records or

'THE REPLACE FACILITY ALLOWS ANY VARIABLE TO BE CHANGED IN A PROGRAM'

22K can be edited — that's about six pages of A4 on the 32K machine. It means that most programs written in Basic can be edited using the quite powerful facilities.

As a word processor it has distinct limitations, although for the home user it is probably adequate. Many of the limitations can be attributed directly to the machine itself — for instance, the Dragon's small screen format makes a good word processor difficult unless one spends a fair amount on the program, and the keyboard 'jump' inherent in the Dragon causes problems with touch-typing. Used as a database, the Editor provides a good search facility with impressive speed.

Presentation

On first examination I was unimpressed with the documentation. It comes in the form of a typewritten A5 booklet of six pages. The first page describes the functions of the program and instructions to load. Pages two to five set out subroutines and access codes, and there's an abbreviated list of keyboard functions.

I would, however, like to have seen some examples in the manual.

I must admit, though, that after an awkward start I got to know the program from the documentation. Although sparse, I found it to be better than others I've seen. And I found the manufacturer willing to help and advise.

Getting started

Loading the program caused no problem. There are two copies on the cassette and it loaded and ran first time. After the copyright statement the screen goes blank and a line of figures appears at the bottom of the screen with a flashing yellow cursor in the middle. It took me a while to work out what the figures meant:

LINE 1 POS 1 : 255 EOF 0

I was positioned at Line 1, Position (character) 1, 255 characters per line and File 0. Here at first the documentation let me down; I do like to have a user friendly program which is menu-driven. But the absence of a menu was soon overcome as the program runs from simple single-letter commands.

In use

Editor The program will accept any file or Basic program as long as it is written in ASCII format. So before loading Editor you have to convert any program into the format assuming that it is originally saved in the more normal compressed form.

Once converted, it is easy to load it into the Editor program following the screen prompts.

The search facility of this part of the program enables you to make a fast check to see, for example, what string variables you may have used in your original program. The REPLACE facility allows any variable to be changed. This is particularly useful if you want to use the Editor to merge two separate programs.

When loading two programs into the machine there's no danger of lines being overwritten since Editor does not need line numbers, but when it's being used to merge two programs, activating the VALUE function will sort the lines into numerical order and duplicate line-numbers will appear consecutively.

Files can be saved onto cassette in the new form — but it will be saved in ASCII and therefore you will have to reload it into the machine later and resave in compressed Basic. The load and save functions are also used in the same way when operating the program as a word processor or database.

Database This requires a bit of thought on the part of the user. The manual fails to show examples of this function. I tried typing in a short record collection database and it worked, but without screen prompts the program leaves it up to you to remember the format you've evolved.

A useful function of the program is that you can nominate any single line-length of up to 255 characters — unlike many of the dedicated database programs which limit you to about 30. This allows you to build up, say, a database of famous quotations.

The ORGANISE or VALUE function makes for efficient use of a database. ORGANISE will sort a series of file records into alphabetical order and VALUE will do this numerically.

Word processor For simple unsophisticated documents the Editor functions well. You can preset the line-length you wish to work to, say 64 characters, and then by using the JUSTIFY function you can type away and the machine will automatically format your text.

There's no automatic wordwrap, but when you get to three characters before the end of a line there's a beep warning. Pressing the RETURN key will automatically add spaces to the end of the line.

Most normal editing features are incorporated, so if you wish to search for and replace a particular word it can be done with one function — useful for addressing letters or correcting a recurring mistake.

There's an automatic centring command, so a heading on a document will be positioned by the computer.

Of course, there have to be compromises on a program of this sort. For the serious user the program does not allow any software-controlled commands to be sent to the printer. If you use a dot matrix printer such as an Epson you can't instruct the printer to underline, change print style or alter the spacing during printing.

While operating the program I did try to crash it but, apart from the machine appearing to hang up when I typed ENTER in error at one point, pressing the BREAK key and then typing GOTO1 found all my text safely stored in memory.

Verdict

Overall I found the program does what it claims. You can spend a lot more money and get less value, but I would like to have

'ANY SINGLE LINE LENGTH UP TO 255 CHARACTERS CAN BE NOMINATED'

seen more informative documentation, both in the manual and on screen.

RATING

Features	■■■■
Presentation	■■■
Performance	■■■■
User interface	■■■
Reliability	■■■■
Overall value	■■■■

Name Editor **Application** Basic program editor, database, word processor **System** Dragon 32 **Price** £9.95 **Publisher** Microplot, 19 The Earls Croft, Cheylesmore, Coventry, W Midlands **Format** Cassette **Language** Basic **Other versions** None **Outlets** Mail order.

Logic Systems has produced a Toolkit for use with the BBC. Ted Ball tools up and reports.

BBC uses Logic

In the dim and distant past (well not quite so distant) when computers were incredibly expensive, many hobbyists had to be content with a machine with 1K or less of RAM which could be programmed only in hexadecimal machine code.

The ROM software in these machines was known as a machine code monitor. It allowed you to look at the contents of the computer's memory, type in and run machine code programs, and it usually had a few extra features to help with debugging.

Hobby computers have grown since those days. The BBC Micro has a very powerful Basic and Assembler in ROM. The Basic and Assembler have been designed to work together, so BBC Basic includes many features that were found in the traditional machine code monitor and allows you to write equivalents of some other monitor features in just a few lines. Because of this a machine code monitor for the BBC Micro does not need to include the simpler features usually found in a monitor, but should include some very powerful features to justify its existence.

The Logic Systems Toolkit for the BBC Model B is a machine code monitor/debugging aid that has, to some extent, been designed on this principle, but does not go quite far enough.

Features

The Toolkit gives you 13 commands which you can type in Basic immediate mode or include in Basic programs. The commands have a similar form to operating system commands, beginning with an asterisk, then a mnemonic for the command and the parameters for the command.

Several of the commands can be easily duplicated in Basic, for example *CHECK XXXX YYYY which prints a hexadecimal checksum of the contents of memory between the hex addresses XXXX and YYYY. All you need to do this in Basic is:

```
S% = 0: FOR I = &XXXX TO &YYYY.
S% = S% + ?I:
NEXT I: PRINT S%
```

The Basic does take longer and involve more typing but is still sufficiently simple to make the *CHECK command appear redundant.

Other Toolkit commands that give little improvement over what you can do easily in Basic are *FIND, which searches for a text string or a string of hex numbers, *HEX, which prints a hex and ASCII dump of memory, *MOVE which moves a block of memory, *MEM which allows you to store hex values in memory, *XEQT which calls a machine code program, and *BREAK which sets a breakpoint.

Provided you are working on your own assembly language source code you can get a simple breakpoint facility in BBC Basic by inserting an RTS instruction where you want the breakpoint and running the machine code with the instruction PRINT USR (&XXXX) where &XXXX is the address of the machine code. This will give you an 8-digit hex number consisting of the contents of the processor's registers when the breakpoint was reached. The Toolkit's breakpoint function does give you more information, but not a lot more.

Documentation

The documentation for the Toolkit says that the *XEQT command has the same function as Basic's CALL and USR statements except that it allows you to set breakpoints, but there is another important difference. CALL and USR set the processor registers from the integer variables A%, X%, Y% and C%, while *XEQT sets the registers to zero. This makes it difficult to use the Toolkit for debugging a machine code subroutine that was designed to have parameters passed to it by a Basic program.

The Toolkit does have commands that you can't provide easily for yourself in Basic. *DIS disassembles machine code from the computer's memory, displaying it with assembly language mnemonics and standard syntax for addressing modes (there is one piece of standard syntax that could have been changed — the disassembler uses a dollar sign to indicate hex numbers instead of the BBC's ampersand).

*RELOC relocates a machine code program, adjusting all the absolute addresses so the program will run at the new address. Of course, with the Assembler in ROM you don't need to disassemble your own programs, and you can relocate your own programs by re-assembling to the new address.

Disassemblers and relocators do have legitimate uses on some computers, where you can't have the assembler and the monitor in memory at the same time. On the BBC their main use appears to be getting at other people's programs where you have only the object code (naughty!).

The most useful debugging aid in the Toolkit is the *STEP command, which steps through a machine code program one instruction at a time, and displays the contents of the registers and a disassembly of the next instruction. However, it takes a long time to step through a large program even though a subroutine is treated as a single instruction. To start single stepping in the middle of a program or inside a subroutine requires messing around with breakpoints.

Presentation

The cassette is clearly labelled and has the Toolkit program recorded on both sides.

The instruction booklet is neatly printed, but consists of only eight small pages and tells you little more than the syntax for the commands and the minimum details of what the commands do.

Because the instructions are so brief, a beginner at machine code will have difficulty understanding what the Toolkit is for, and even an experienced programmer will have to put in some thought and experiment before discovering its full power and how to use it effectively.

In use

The Toolkit commands are easy to remember and the syntax is fairly straightforward and obvious. It is also very fast in operation. For example the *DIS and *HEX commands print a screenful of information almost instantaneously.

Many things are, however, tedious and could have been made easier by making the commands more versatile. If you want specific values in the registers when you start running a program with *XEQT or *STEP you will first have to write a short program that loads these values and then jumps to the program you want to test.

The loading instructions tell you what you should see when the Toolkit has loaded. Although I got the 'Toolkit ready' message I also got additional error messages consistently — 'No such variable' from one side of the tape and 'Syntax error' from the other. However, when I tried out the Toolkit all the commands worked as described in the booklet, and I didn't find any bugs in the program.

The Toolkit has error checking on the commands and gives error messages if you type in an incorrect command name, if the parameters are not correct hex numbers, or if you don't give enough parameters for a command.

Verdict

Although the Toolkit works reliably and has some useful features it is not fully compatible with the features provided in BBC Basic for using machine code. Even its most useful commands are not versatile enough to make it worth recommending.

RATING

Features	■■■
Documentation	■■
Performance	■■■
Useability	■■
Reliability	■■■■
Overall value	■■

Name Toolkit **Application** Machine code debugging aid **System** BBC Microcomputer, Model B **Price** £8.95 **Publisher** Logic Systems, 129, High Street, Cherry Hinton, Cambridge (0223) 210669. **Format** Cassette **Language** Machine code.

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STINGS AND THINGS

COMMODORE 64

Sting in the tail

Name Super Gridder **System** Commodore 64 **Price** £9.95 **Publisher** Terminal Software, 28 Church Lane, Prestwich, Manchester M25 5AJ **Format** Cassette **Language** Machine code **Other versions** Vic-20 **Outlet** Most retailers.

Scorpions are not the most lovable of creatures and in this game, they don't do anything to smarten their image. They are engaged in trying to sting you. You are unflatteringly represented by a rolling-eyed, idiotically-smiling face.

Objectives

Starting on a large size grid, you must zoom around, passing over every line. Each time you complete a box, it is coloured in.

You go on to the next level only when all the boxes are filled in.

Meanwhile, two scorpions are on the attack. You can put them off the scent by pressing the fire button which leaves a gap on the grid line, over which the scorpions cannot jump.

This gap is sealed the next time you pass over it. There are 8 levels, each with different grid layouts.

If you manage to succeed on level 8, the two scorpions invite a friend to tea, and, if you still survive, the party grows. You have three lives.

In play

An introductory burst of beepy music rapidly gets on your nerves since it is also played between rounds. You start (or rather your face does) in the top left of the grid. One scorpion sets off from the upper right, the other from bottom left. The two scorpions, one white, one black, are animated. However, the black one didn't show up too well on my screen adding to my problems of survival. If you hit a deadend while hurtling around the grid you bounce back the way you came.

Response to the joystick was a wee bit sluggish on occasion. If a scorpion catches you, the screen freezes, then shows the grid highlighted so as to clearly indicate what bits still need to be traversed.

Although a very simple game with no frills, it is curiously addictive. It should be quite easy to elude these pernicious creatures but it isn't. You know the excuses: 'I was distracted by that butterfly burping. I'll just have one more go and show the little blighters'. And so on into the night.

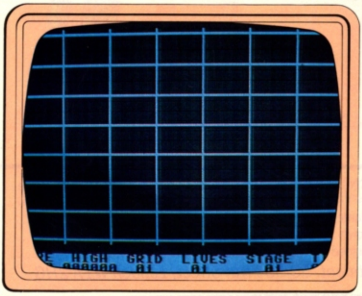
Verdict

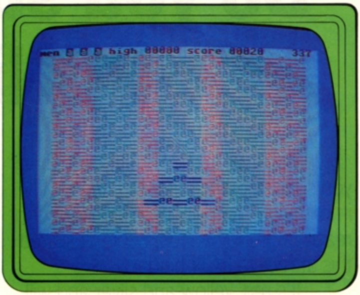
An enjoyable, if graphically uninspired, game. A little overpriced for what it offers but nonetheless quite a compelling piece of frivolity that could give hours of fun.

Bob Chappell

RATING

Lasting appeal	3
Playability	3
Use of machine	3
Overall value	3





COMMODORE 64

Out to munch

Name 3-D glooper **System** Commodore 64 **Price** £8 **Publisher** Supersoft, Winchester House, Canning Road, Wealdstone, Harrow HA3 7SJ **Format** Cassette **Language** Machine code **Other versions** None **Outlet** Mail order and most dealers.

Take one basic Pacman theme, set it in a three dimensional maze, increase the height and width of the maze walls to life-like proportions, then, for that extra something, make the monsters as big as houses. This should give you some impression of 3-D Glooper.

Objectives

Very simple. All you have to do is race round a maze in search of large blue floor-tiles. Passing over a tile causes it to disappear and you score ten points. There are over 300 tiles so you have quite a bit of maze to ramble through. A few red tiles are scattered about. Crossing one of these enables you, temporarily, to be a monster muncher instead of a monster's lunch. The monsters are huge yeti-like creatures, brown, furry and yellow eyed. They turn orange when you pass an elusive red tile. Unlike other games, no warning is given when they are about to turn back to their normal, carnivorous selves.

If you succeed in erasing all the blue tiles, you move on to a higher level where the gloopers roam in higher number.

In play

A plain and innocuous 'prepare to meet the Gloopers' message is all you get by way of an introduction. You are then shown the entrance to the brick built maze. The maze itself is graphically impressive — large size walls with plenty of twists and turns. Moving your joystick (the keyboard can be used instead) causes you to rush along at high speed, the vista changing around you.

There is no overview of the maze and, unless you have a superhuman sense of direction, there's no way you're going to avoid getting lost. The only help you're given is a small display at the top of the screen. This appears from time to time and shows the part of the maze immediately around you.

Other information given is a counter which tells you how many blue tiles remain, the high score and current score. You receive a one thousand point bonus for every glooper munched. Sound effects are fairly minimal: a whoosh as you pass over a tile, the menacing sound of munching and a crash when you hit a glooper.

Rounding a corner and coming face to face with one of these hairy horrors is the most impressive part of the game.

Verdict

A good game with some of the biggest monsters you're likely to see.

Bob Chappell

RATING

Lasting appeal	3
Playability	4
Use of machine	3
Overall value	4

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Bob Chappell finds a few prize blooms in the latest flowering of Oric games.

Oric game-frame

Hidden inside the Oric is a game machine struggling to get out. The problem for software writers is that Oric has been reluctant to reveal just how the insides work. The result is a challenge to the games writers to find out all the tricks and special effects for themselves. Here is how some of the latest releases shape up.



THE ULTRA

Starting with what is certain to become a best seller for the Oric, The Ultra is a graphically superb game that has you zapping 16 different varieties of aliens, each with its own formation and attacking pattern.

The game opens with your ship executing an impressive jump through hyper space to where the action is. First up are the green snappers — easy targets against the starry backdrop. Next come the blue meanies, a swirling bunch of wriggling space invaders. To follow, a crescent of rather beautiful revolving hexagonal barrels who arc around the screen, raining bombs all the while. It's a shame to pot these lovely creatures. Ah, well, on you go to a host of pulsating yellow ellipses that would have had Wordsworth forgetting about his daffodils. There are a further 12 screens of differently hued and fashioned aliens to conquer.

You have five lives and limitless missiles. Firing haphazardly causes your ship to overheat and the missile launcher to quit temporarily until the ship cools down.

Magnificent graphics and great fun — a must for Oric owners. It shows that the Oric is capable of great things when fed with a quality program.

HOPPER

As it's likely that only judges and hermits have never heard of Frogger, I'll be extra brief. This is a very good version with the screen teeming with movement. Attractive graphics and well worth buying, especially if you've always wanted a Frogger of your own.

ORIC TREK

This is the Oric version of Salamander's excellent real-time Star Trek program. Long and short range scanners, photon torpedos, hyperprobes, shield control, warp drive, black holes, messages from Scotty, Uhura, *et al*, and oodles of Klingons. What more could a Trekkie ask for? The game comes complete with a clear 12 page manual with a handy command summary. Every micro games player must have at least one version of Star Trek for the collection, and this is one of the best.

STARFIGHTER

This game suffers in contrast with the previous one. It starts with an impressive console window through which you can see your ship in space, but it soon becomes apparent that there is not a lot to retain one's interest. You travel the galaxy (pressing the cursor control keys) searching for and destroying all alien ships. Unlike the traditional Star Trek games, you have no control over shields, warp, speed, crew, etc. All you can do is press keys to move your ship and fire at any passing enemy.

A fairly simple game which has entertainment value but does not give you enough variety or depth.

ORIC MUNCH

A competent version of the pill gobbling, fruit munching, ghost chasing, maze running favourite. The ghosts seem to have left their brains at home since they rush about quite aimlessly, often getting trapped in corners. The first nine levels are selectable (different layouts, speeds and colours). Thereafter, you ascend only by proving your merit.

An enjoyable version of a classic.

LIGHT CYCLE



Tron surfaces again. You control a bike which blazes a trail across the screen. The aim is to force the opposition's bike to crash. Nine speed levels are available and you can give your bike some extra zip by pressing the booster key. Colliding with a wall, one of the Rom towers or a trail results in the loss of one of your five lives. You can play against the computer or have a two player game. The first to lose all five lives is kaput. The longer you take to dispatch the enemy, the more points you get.

Good value.

The Ultra, Hopper and **Light Cycle** (£6.95) — PSS, 452 Stoney Stanton Road, Coventry CV6 5OG
Oric Trek (£9.95) — Salamander Software 0273 771942
Oric Munch (£8.35) — Tansoft, 3 Club Mews, Market Square, Ely, Cambs CB7 4NW
Starfighter (£6.95) — Durell Software, Castle Lodge, Castle Green, Taunton TA1 4AB
The above are all available by Mail Order or from Juniper Computing, Wilts., (06662-2689) and other dealers.

ALLEY ANGST

BBC B

Mirage massacre

Name 3D Bomb Alley **System** BBC B **Publisher** Software Invasion, 50 Elborough Street, Southfields, London SW18 5DN **Price** £6.95 **Format** Cassette **Outlets** Mail order.

The Falklands war inspired a series of arcade-type games for leading micros. 3D Bomb Alley from the appropriately named Software Invasion is for BBC owners who want a share of the action. And action is what you will get if you can last the course.

Objective

You are looking down a bay (or is it a bluff cove?) where riding at anchor are three ships. You are in the defensive front line, commanding an anti-aircraft battery. You scan the sky looking out for enemy aircraft, ready to fire your shells to destroy them.

You can control the firing with a cross which is the centre of the gun fire.

The sky is clear. A tiny black dot appears and begins to grow in size becoming not a dot but a small plane armed with two bombs. The bombs fall, there is a great explosion and one of the ships is gone.

Your orders are to shoot down the planes before they can release their deadly payload. At first it is easy as the planes come one at a time. But after you shoot down the first ten planes they start coming in twos and later in threes and so the shooting gets tougher.

In play

On hitting the growing dot, there is a 'Defender' type explosion as bits of shrapnel shower over the landscape. Another nine planes follow one by one and the same thing happens.

This is easy.

As you move up the next level you not only get an extra plane but you also get an extra ship to defend as well. As more and more planes come one of the dots becomes not a dot but a Mirage. It breaks through your defensive screen. There is a blinding flash and one of your ships has gone.

The war gets worse as ship after ship goes under. Eventually you are left with just one ship and the last Mirage gets through dropping the black bomb as it goes.

The game is over with a terrific explosion.

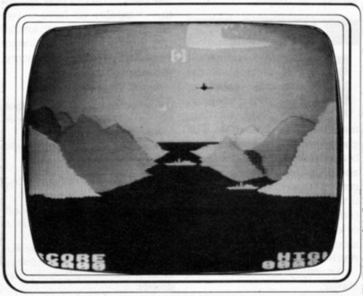
Verdict

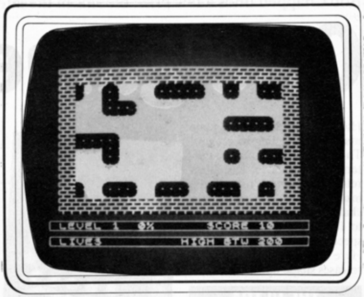
Like the other games from Software Invasion, this one makes use of the new found BBC colours like dark and light shades. With good moving graphics and sound effects the game becomes addictive. You'll get your money's worth out of this program.

Kevin Williams

RATING

Lasting appeal	●●●●
Playability	●●●●
Use of machine	●●●●●
Overall value	●●●●





SPECTRUM

Swinging crawly

Name Splat **System** Spectrum (48K) **Price** £5.50 **Publisher** Incentive Software Ltd, 54 London Street, Reading RG1 4SQ **Format** Cassette **Language** Machine code **Other version** None **Outlet** Spectrum dealers.

The quality of artwork on software advertisements and cassette inserts has increased enormously of late. Not surprisingly, stiff competition has forced software houses to ensure that their products catch your eye. However, an impressive cover is no infallible guide to the program's quality. It was with some trepidation, therefore, that I loaded a new game, Splat!, which came enclosed in a glittering foil-fronted cover. My anxiety was unfounded.

Objectives

Contolling Zippy, a new species of hero resembling a four-legged spider, you must manoeuvre him/her/it through a seven level maze to reach the exit. On the way, you must eat grass and plums, and avoid spikes and water. The whole Hampton Court complex slides about unpredictably. Bounded on all sides by a fixed wall, it swings up, down, left and right, for varying durations. You must avoid blundering into the outer wall, or, what is more of a problem, getting trapped against it like a fly swatted on a window-pane. Points are gained by gulping the grass and plums, and for reaching a new level.

In play

Full on-screen instructions are supplied. The options allow you to use the keyboard, or a Kempston or AGF joystick.

Ready for the off, Zippy is placed in the central portion of the chunky maze which immediately starts moving, in a tick-tock fashion, to one of the four cardinal compass points. It continues on the same course for several seconds before deciding to head off elsewhere. In the meantime, you have to manipulate Zippy so that he doesn't get carried off and splatted against a wall.

As well as preventing Zippy from getting turned into strawberry jam, you must also try to gobble up as many clumps of grass as possible. Some of which are tucked down dead-end alleys.

Level two gives you some plums as an extra enticement but there are also rivers to cross. Later, red spikes need avoiding. The menu tells you that the exit is on level seven and adds, 'No chance!' — I can well believe it.

As an added incentive, ISL is offering a £500 prize for the highest score reached by 14 January 1984. Every time you score over 500 points, a unique code is presented on the screen and entrants must submit the score and code.

Verdict

An original and entertaining game which hooks you after just a few minutes' play.

Bob Chappell

RATING

Lasting appeal	●●●●
Playablility	●●●●
Use of machine	●●●●●
Overall value	●●●●●


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BLUES AND REDS

COMMODORE 64

Gold turkey

Name California Gold Rush **Application** Arcade Game **System** CBM 64 + joystick **Price** £7·95 **Publisher** Anik Microsystems 0604 41 1012 **Other versions** Spectrum, Dragon **Outlets** Mail order.

Prospector Jake has found 24 areas rich in gold mines, and to claim these he must surround them with a fence. The local Indian tribe is very upset by this intruder and attempts to tear down all Jake's fences.

Objectives

Once Jake has completely surrounded his mine with a fence, it is his to keep. The Indians are busy ripping down the fences. If he collides with them he may lose one of his five lives. The only tool Jake has is a reuseable stick of dynamite which, when it explodes, leaves a pile of rubble blocking the path. One Indian patrols the perimeter to rip down perimeter fences and clear the rubble. Jake must drop the bomb while on the move as contact with the cheap-grade nitro is fatal for him (not so for the Indians).

In play

The instructions need a third reading to make total sense. Movement around the maze needs very accurate manipulations of the joystick. There are 24 levels of play which can be directly entered at the start of the game.

Levels 13-24 are identical to levels 1-12 but the Indians now have bows and arrows. 1 or 2 players can play.

The graphics used are quite simple. The lettering and blocky scenery imply standard graphics but there are six Indian sprites, an arrow sprite, and Jake and bomb sprites. The fence consists of a rather unimaginative row of '+' signs. User-defined graphics such as a bag of gold and the pile of rubble do inject a little into the presentation.

With the flavour of the Gold Rush of '86 and sounds of the war dance, the effects are a real audiovisual minestrone. More thought should have gone into the sound and graphics. A cactus here, a little fiddle music there would have helped.

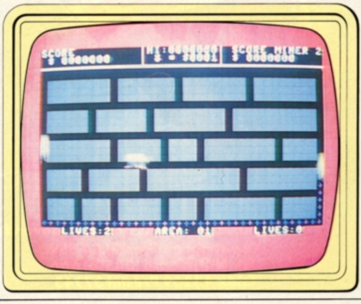
Onto idiot-proofing. The STOP key is disabled, but the RUN and RESTORE sequence causes my 64 to refuse to obey Basic, and one simple poke can fix that. After the crash I had to power down and wait another three minutes to load the game.

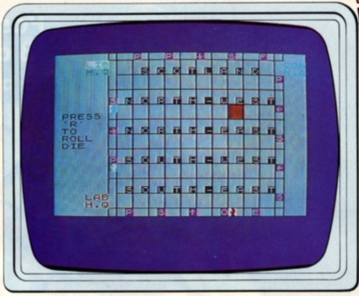
Verdict

A very enjoyable game with a few pitfalls. It is original and reasonable value for money. It beats hell out of some rubbish I've seen for the '64. There's no mindless mayhem and anybody can play it. With a few changes it could become another Pacman.

Sandro de Rosa

RATING	
Lasting appeal	4/4 icons
Playability	4/4 icons
Use of machine	2 icons
Overall value	3 icons





SPECTRUM

Benn party?

Name General Election **System** Spectrum 48K **Price** £5.95 **Publisher** Bug-Byte, Mulberry House, Canning Place, Liverpool 051-709 7071 **Format** Cassette **Language** Basic **Other versions** None **Outlets** High street dealers

The thought of a computer-styled board game based round a General Election made me feel that in my case it would prove more of a bored game, but once you've got the hang of the inevitably complicated rules there's actually plenty to be enjoyed.

Objectives

The aim of each of the 2-4 players is to do a Maggie and ruin the country . . . sorry, run the country by winning a majority of the 100 seats on offer.

The rules are rather daunting, taking up nearly five sides of the cassette insert, and as usual when faced with densely packed instructions I plunged into the game and picked up things as I went. It doesn't always work, but it does here.

In play

You first choose the number of players, and then select the party each is to represent from Conservative, Labour, Liberal and SDP. I'm afraid potential Raving Loonie candidates will have to do a substantial re-write to the program if they want to play.

The board itself consists of 24 outer squares round which the players move in turn after the Spectrum throws the dice, and 100 inner squares representing 20 seats in each of five regions: Scotland, North East, North West, South East and South West. Those 20 seats range from the very safe to the very marginal.

In moving round the board you might land on one of a variety of squares. An arrow indicates a particular region, and landing there effectively gives you two seats in that region, chosen at random. An 'S' gives you a 1% regional swing, with a 75% chance of increasing the swing each time you land on that square. A 'P' asks you to choose your most important policy out of five on offer, the computer having already weighted these.

Although written in Basic, there is a liberal (if you'll pardon the expression) use of PEEKs and POKEs to speed up things, and the responses are generally quick enough to avoid wandering minds. As with any good game, the elements of chance and skill are combined well, and for once the minimal use of sound is welcome, as anyone who's heard a party political broadcast will agree.

Verdict

If you like politics then you'll probably enjoy this, but if, like me, the announcement of a General Election has you looking up the first available holiday departures then let me assure you that this game is much more enjoyable.

Mike Garrard

RATING	
Lasting appeal	3 icons
Playability	4 icons
Use of machine	4 icons
Overall value	4 icons

fantasy

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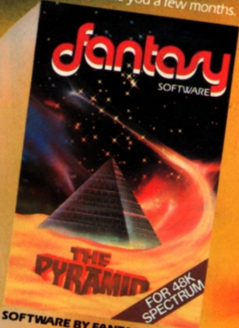
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Which book would your micro want you to buy? *PCN*'s review page helps you choose.



'Pascal Programs for Games & Graphics' by Tom Swan, published by Hayden (paperback, 214 pages).

After all the criticisms of Pascal on the grounds that it's autocratic, inflexible, and more than a little chaotic (which, one may add, it's proponents have endured with ill grace), it's a real pleasure to find *Pascal Programs for Games & Graphics*, by Tom Swan.

It's a book which proves that Pascal as a language is no less capable than any other, and that its limitations are often brain-related.

The subject is, as the title indicates, concerned largely with the less weighty side of using Pascal, but this doesn't mean that the programs are trivial. Some of the games are almost of arcade quality, and in addition to a special Library Unit, there are four that are actually useful.

These four, a character editor, a picture-editor, a touch-up utility and a picture-printer, comprise the main core of a practical computer-aided design system which, with small effort, could be expanded into a professional product.

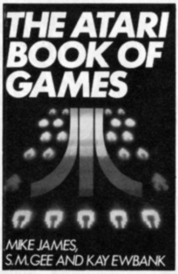
A pleasure to read, and a useful addition to the library of many Pascal-dabblers. **RK**

'The Atari Book of Games' by Mike James, S M Gee and Kay Ewbank, published by Granada at £5.95 (paperback, 156 pages).

This book joins a range from Granada covering micros which include the Oric, Newbrain, Lynx and Commodore 64.

It features games for both the 400 and 800, explaining that the drives of the 16K Atari 400 will have to be disconnected to get sufficient memory to run the four biggest programs in the book.

These are Capture the Quark, Laser Attack, Treasure Island and Smalltalker. But there are another 17 programs in the book which, if you've got the patience to type them in, should help you understand.



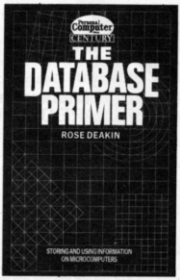
The authors provide an excellent introduction which gives all the help you'll need. The games chapters offer typing tips, subroutine structures, details of special programming techniques and suggestions for further improvements.

The program listings vary in length between two and five pages, instructions are clear and comments concise, helping you to use the listings to the full. **WP**

'The Database Primer' by Rose Deakin, published by Century at £6.95 (paperback, 154 pages).

The Database Primer is designed to help you get the most out of your machine when dealing with data storage and manipulation. Its 14 chapters begin with a rundown of the majority of keywords such as file, Database and search.

The book then explains what

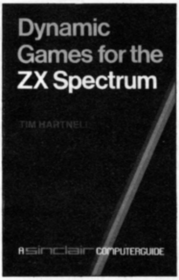


a database consists of and its advantages. Simple but relevant examples are given to illustrate the points made.

Chapters four, five and six deal with more complicated examples of databases, with advice on how to enter and retrieve data to the base.

The other chapters deal with performing calculations on the data, sorting, selecting, and mathematical functions. The book also deals with using more than one file, menus and command files.

It is easy to read, does not go over the top on the information provided nor is it boring. The chapters are presented well and the layout good. **TJ**



'Dynamic Games for the ZX Spectrum' by Tim Hartnell, published by John Wiley & Sons at £5.95 (paperback, 186 pages).

Many books bombard you with listing upon listing for your favourite computer, but although they may be a cheap source of games — if you can stand the finger-bashing — they usually offer little of educational value.

Dynamic Games for the Spectrum takes a similar approach but has the bonus that each game is given an introduction which takes you through the programs line by line. The tricks used are explained and various modifications are suggested.

The programs are mainly for games which fall into four categories: arcade, board, adventure and simulation. The usual games such as Tic Tac Toe, Chess and Checkers can be found but there are some originals.

This book is fairly well written and the text is easy to read. Some programs also include a diagram of a screen shot which gives an idea of what the game should look like before you begin to key it in.

The listings vary in readability, however, and some are only just legible.

The final chapter in the book contains hints and tips about improving your programs, and there is the usual machine code renumber given in the appendix. **TJ**



'Functional Forth for the BBC Computer' by Boris Allan, published by Sunshine at £5.95 (paperback, 116 pages).

Functional Forth for the BBC Computer is not a teach-yourself Forth book. Instead it analyses how the language works and functions. Forth is a compiled language like Pascal, whick means its speed of execution should be faster than the speed of a language such as Basic.

The ten chapters explain how the system works and include topics such as Forth words and pointers, the all important stack, vectors, control structures, logical functions, sound effects, graphics and the operating system.

They contain many examples and definitions of terms. Also provided are charts and diagrams.

The author obviously knows his subject but the style of presentation is not as good as it could have been for a text of this nature.

The author claims that the reader should understand his computer through the use of Forth. But I reckon that any reader who understands this book without too much effort will be doing fine. **TJ**

PCNProgramCards

We have two new programs this week, one from Richard Smith, of Torbay, Devon for the BBC, and one from John Edyvane, of Peterborough, Cambridgeshire for the Lynx.

The Readage program for the Lynx is used, as the title implies, to work out your reading age. You have to type in 300 or so letters grouped into words and sentences. From this, taking into account various things like word length and the number of syllables, it works out your reading age.

DUMP is a utility for the BBC. It is actually a machine code program, and the Basic program on the first card is used to do the assembling. The routine is used from Basic to dump all the variable names currently in use to the screen.

It dumps reals, strings, arrays and string arrays. The system integers A% to Z% are not dumped, but two or more letter integers are. Arrays are denoted by an open bracket after the name.

The program is presented in two formats — the first is the program used to assemble the code, the second is the assembly listing, which will help to check correct entry.

It operates by intercepting the system command line interpreter routine. The address of the dump routine is placed into &208 and &209. Whenever *DUMP is used, the OSCLI will go to DUMPCH which checks whether DUMP has been entered. If not then the program jumps to the system OSCLI routine.

Those of you with disk systems will have noticed that a *DUMP command already exists. Don't fret though, they will both work in the same system. The disk dump routine needs a file spec following it, which will differentiate between the two. The program needs to be stored in memory somewhere, and the version printed starts at &D00. The disk system uses this bit of memory, so you have to move it.

If you aren't using user defined characters then &C00 is available, and if you aren't using the cassette or the RS432 then &A00 is available. The Break key holds a routine to re-initialise the routine.

Our apologies for the fact that the BBC utility billed in last week's issue was not included. It does, in fact, appear this week. Note also that the ZX81 Knockout Whist program has only four cards, not five.

Finally, the program used in our show competition (*see below*) will be published in ProgramCards after the show.

If you want to see your program in print, along with your name, why not send it in to ProgramCards? We pay for any programs that we publish according to length, originality and good programming technique. Send them in on cassette or disk, or if they are short then a listing will do. All programs should be accompanied by a listing and a brief outline of how the program works, in the form of comments. As soon as we have looked at them and/or published them, they will be sent back at our expense.

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You'll find more details of the PCW Show in next week's issue of *PCN*, on sale at the Barbican as well as at your local newsagent. There's a bonus, too. *PCN*'s writers will be on hand to offer advice on microcomputing problems.

See you there . . .

PCN

Cut out and bring to the PCW show

COMPETITION

... at the PCW show!

PCN ProgramCards

Dump — Card 1 of 3

8328DU1/3

BBC B
BBC Basic Assembler

Application: Utility
Author: Richard Smith

```
>LIST
   10START%=&D00:OSASCI=&FFE3:OSNEWL=&FF
E7
   20$(START%+2)="DUMP":$(START%+7)="
                                  "+CHR$13
   30FORPASS=0TO1STEP1:P%=START%+41
   40[OPTPASS
   50.INIT LDA&208:LDY&209:STASTART%:STY
START%+1:LDA#DUMPCH MOD256:LDY#DUMPCH DI
V256:STA&208:STY&209:LDY#0:.LP2 LDASTART
%+7,Y:JSROSASCI:INY:CPY#34:BNELP2:RTS
   60.NODUMP LDX250:LDY251:JMP(START%)
   70.DUMPCH STX250:STY251:LDY#5:.LP1 LD
A(250),Y:CMPSTART%+1,Y:BNENODUMP:DEY:BNE
LP1
   80.DUMP LDA#65:STA&70:.VAR ASLA:TAX:L
DA&400,X:STA&71:LDA&401,X:STA&72:.VAR2 B
EQNEL:LDX&70:TXA:JSROSASCI:LDY#2:.NAMEL
LDA(&71),Y:BEQANO:TAX:JSROSASCI:INY:BNEN
AMEL
   90.ANO JSRESCAPE:JSROSNEWL:LDY#0:LDA(
&71),Y:TAX:INY:LDA(&71),Y:BEQNEL:STX&71:
STA&72:JMPVAR2
  100.NEL LDA&70:TAX:INX:CPX#123:BEQFINI
SH:CPX#91:BCCOK:CPX#97:BCSOK:LDX#97:.OK
TXA:STX&70:JMPVAR
  110.FINISH RTS
  120.ESCAPE BIT&FF:BPLFINISH:BRK
  130]NEXT
  140?P%=17:$(P%+1)="Escape"+CHR$0
  150DIM S 15:$S="KEY10CALL"+STR$INIT+"|
M":X%=S MOD256:Y%=S DIV256:CALL&FFF7
  160CALLINIT
>VDU 3
```

Line	Description
10	Define start of code and OS routine addresses
20	Put strings into memory, note that the space is left for a boot up message.
30	Begin a FOR NEXT loop for assembling the code and set the program counter P% to the beginning of the code plus 41
40	Start assembler and define pass level.
50	Initialisation routine that changes the pointer to intercept the command line interpreter routine at &208, &209.
60	Jumps to normal routine if the string DUMP is not intercepted.
70	Check to intercept the dump command via OSCLI.
80	Actual dump routine, look up position of variable and print it.
90	Prepare for next variable.
100	Prepare for the next initial letter variable.
110	End machine code and return to Basic.
120	Check for escape key subroutine.
130	End assembler.
140	Put escape string into memory.
150	Define the Break key to call the initialisation routine.
160	Do initialisation.

PCN ProgramCards

Dump — Card 2 of 3

BBC 'B'
8329DU2/3

```
>*LIUSTST DU
    1
    2 0C29          OPTPASS
    3 0C29 AD 08 02 .INIT LDA&208
    4 0C2C AC 09 02 LDY&209
    5 0C2F 8D 00 0C STASTART%
    6 0C32 8C 01 0C STYSTART%+1
    7 0C35 A9 54     LDA#DUMPCH MOD256
    8 0C37 A0 0C     LDY#DUMPCH DIV256
    9 0C39 8D 08 02 STA&208
   10 0C3C 8C 09 02 STY&209
   11 0C3F A0 00     LDY#0
   12 0C41 B9 07 0C .LP2 LDASTART%+7,Y
   13 0C44 20 E3 FF JSROSASCI
   14 0C47 C8        INY
   15 0C48 C0 22     CPY#34
   16 0C4A D0 F5     BNELP2
   17 0C4C 60        RTS
   18 0C4D A6 FA     .NODUMP LDX250
   19 0C4F A4 FB     LDY251
   20 0C51 6C 00 0C JMP(START%)
   21 0C54 86 FA     .DUMPCH STX250
   22 0C56 84 FB     STY251
   23 0C58 A0 05     LDY#5
   24 0C5A B1 FA     .LP1 LDA(250),Y
   25 0C5C D9 01 0C CMPSTART%+1,Y
   26 0C5F D0 EC     BNENODUMP
   27 0C61 88        DEY
   28 0C62 D0 F6     BNELP1
   29 0C64 A9 41     .DUMP LDA#65
   30 0C66 85 70     STA&70
   31 0C68 0A        .VAR ASLA
   32 0C69 AA        TAX
   33 0C6A BD 00 04 LDA&400,X
   34 0C6D 85 71     STA&71
   35 0C6F BD 01 04 LDA&401,X
   36 0C72 85 72     STA&72
   37 0C74 F0 2A     .VAR2 BEQNEL
   38 0C76 A6 70     LDX&70
```

Lines	Description
3-6	Get the OSCLI indirect address from &208 and &209 and store it at START% and START%+1
7-10	Put address of DUMPCH in &208, &209 so that all calls to OSCLI go through DUMPCH.
11	Initialise the Y register to zero.
12-13	Load the accumulator from START%+7+Y on the zero page and print it on the screen using OSASCII.
14-15	Increment Y and execute the loop beginning at LP2 until Y=34 ie print the 34 characters.
17	Return to calling routine (BASIC), initialization being complete.
18-19	Load X and Y from 250 and 251, these point to the command string in memory. (see page 463 of the user guide).
20	Jump indirect to OSCLI routine. This takes the values in START% and START%+1 and uses them as an address to jump to. This is executed if the * command is not DUMP.
21-22	X and Y point to the command (DUMP), these are put into 250-251.
23	Put 5 into the Y register.
24	Get character from command location plus Y.
25	Compare entered command against DUMP.
26	If the characters are not the same then branch to NODUMP.
27-28	Check the rest of the characters.
29-30	Begin the dump, load A with 65 and store it at &70.
31-36	Get the location of the variable from the language workspace and place the address in locations &71 and &72.
37	If A is zero then branch to NEL.
38-40	Print character in &70.

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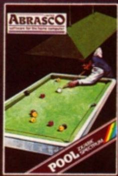
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PCN Program Cards

Dump Card 3 of 3

BBC 'B'
8329DU3/3

```
39 0C78 8A          TXA
40 0C79 20 E3 FF    JSROSASCI
41 0C7C A0 02       LDY#2
42 0C7E B1 71       .NAMEL LDA(&71),Y
43 0C80 F0 07       BEQANO
44 0C82 AA          TAX
45 0C83 20 E3 FF    JSROSASCI
46 0C86 C8          INY
47 0C87 D0 F5       BNENAMEL
48 0C89 20 B9 0C    .ANO JSRESCAPE
49 0C8C 20 E7 FF    JSROSNEWL
50 0C8F A0 00       LDY#0
51 0C91 B1 71       LDA(&71),Y
52 0C93 AA          TAX
53 0C94 C8          INY
54 0C95 B1 71       LDA(&71),Y
55 0C97 F0 07       BEQNEL
56 0C99 86 71       STX&71
57 0C9B 85 72       STA&72
58 0C9D 4C 74 0C    JMPVAR2
59 0CA0 A5 70       .NEL LDA&70
60 0CA2 AA          TAX
61 0CA3 E8          INX
62 0CA4 E0 7B       CPX#123
63 0CA6 F0 10       BEQFINISH
64 0CA8 E0 5B       CPX#91
65 0CAA 90 06       BCCOK
66 0CAC E0 61       CPX#97
67 0CAE B0 02       BCSOK
68 0CB0 A2 61       LDX#97
69 0CB2 8A          .OK TXA
70 0CB3 86 70       STX&70
71 0CB5 4C 68 0C    JMPVAR
72 0CB8 60          .FINISH RTS
73 0CB9 24 FF       .ESCAPE BIT&FF
74 0CBB 10 FB       BPLFINISH
75 0CBD 00          BRK
76
>VDU 3
```

42	Load A from the address given in &71 and &72 plus the contents of Y.
43	If zero then jump to ANO.
45-46	Print character in A onto the screen.
47-48	Increment Y and continue to execute from NAMEL until Y is zero.
49	Jump to subroutine to see if escape key has been pressed.
50	Print a carriage return and line feed to the screen.
51-58	Put location of next variable in &71 and &72.
59	Jump to VAR2.
60-63	If contents of &70 is 123 then finish.
65-66	If less than 97 then OK.
67-68	If greater than 97 then OK.
69	Else put 97 into the X register.
70	Then into the accumulator.
72	Jump to VAR
73	Return to BASIC.
74-75	Check escape key subroutine.
76	Do break if escape is pressed.

PCN Program Cards

Proclarge Card 1 of 1

8329 PL1/1

BBC (A/B) OS 1.2
BBC Basic

Application: Utility to enlarge and move strings
Author: Leon Goodfriend

```
32000DEFPROCLARGE(A$,X,Y,XS,YS)
32010IF A$=""ENDPROC
32020LOCAL A%,X%,Y%,AD%,B%,C%,D%,E%,F%
32030A%=10:X%=0:Y%=13:AD%=X%+256*Y%
32040MOVE X,Y
32050FOR B%=1TO LEN A$
32060?AD%=ASC MID$(A$,B%)
32070CALL &FFF1
32080FOR C%=1TO8
32090D%=C%?AD%
32100FOR E%=7TO0STEP-1
32110F%=83-2*SGN(D% AND 2^E%)
32120PLOT 0,XS,0:PLOT F%,-XS,-YS:PLOT F%
,XS,0
32130PLOT 0,0,YS
32140NEXT
32150PLOT 0,-8*XS,-YS
32160NEXT
32170PLOT 0,8*XS,8*YS
32180NEXT
32190ENDPROC
```

32000	Start definition of procedure and pass into it the X,Y position of the text and the X,Y sizes
32010	If a null string has been passed into the procedure via A$ the procedure is ended
32020	Declare local variables. Note that these are set to zero when declared, also note that they do not have the same values outside the procedure, if used
32030	Set up variables to preset values. A%, X% and Y% are used to pass values into the A, X and Y registers of the processor when a machine code subroutine is called. X% and Y% are used to point to a location in memory that the OS routine uses. A% passes a value to select the correct routine, X% and Y% point to 3328 (and D00 hex)
32040	Move the graphics cursor to X Y. X and Y were passed into the procedure at the beginning
32050	Begin a 'FOR NEXT' loop that counts along the characters in A$
32060	Put the string, starting from the character pointed to by B%, into memory as &D00
32070	Call the OSWORD routine at AFFF1 with A%=10 and X% and Y% pointing to &D00. This reads the character definition of the letter code (ASCII) at &D00 and returns the definition in memory locations &D01 to &D08. The character definition is returned as eight bytes which are used in the same way as the VDU23 character defining command
32080	Begin a 'FOR NEXT' loop to count the rows of the definition using C%
32090	Set D% equal to the contents of the address given by AD%+C% (&D00+C%)
32110	Set F% to the correct plot command. The bits that are picked out are used to set the F% to 83 or 80 to either plot a triangle in foreground colour or just move without plotting any colour
32120	Draw the block using XS to define the horizontal size and YS to define the vertical size
32130	Move the cursor back to the X,Y position. Note that all plots are relative from X,Y
32170	Move the cursor to the top left hand corner of the next character

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PCN Program Cards

Readage

Card 1 of 2

8329 RA1/2

Lynx
Lynx Basic

Application: Educational
Author: J Edyvane

```
110 REM
120 REM Calculates reading age of typed-
130 REM in text, using the Flesch Index
140 REM of reading ease. The reading
150 REM ease score has a range of 0 to
160 REM 100.
170 REM
180 REM ref:'Readability and Science
     Textbooks' by W.Graham
190 REM School Science Review
200 REM vol 59. No.208. March 1978
210 REM page 545.
220 REM
230 TEXT
240 INPUT "What is the title of the text
 to be      analysed";T$
250 PRINT
260 INPUT "Who is the author";W$
270 CLS
280 PRINT "Type in a sample of text unti
l you hear the tone."
290 PRINT "?????????????????????????????
???????????";
300 REM
310 REM F,G are flags for deletion
320 REM M=maximum number of words
330 REM W=words,S=sentences,P=letters
    C counts characters for line feed
340 REM L is ASC code of current letter
350 REM
360 LET F=0,G=0
370 READ M
380 LET W=0,S=0,P=0,C=0
390 REM
400 REPEAT
410    LET C=C+1
420    LET L=GETN
430    PRINT CHR$(L);
440    IF L=13 THEN  GOSUB  LABEL PRINT
450    IF NOT(L=45 OR L=93 OR L=41 OR L=3
2 OR L=44 OR L=46 OR L=33 OR L=63 OR L=5
8 OR L=59 OR L=34) THEN  GOTO 490
460    IF NOTF THEN  LET W=W+1,F=1
470    IF L=33 OR L=46 OR L=63 THEN  LET
S=S+1,G=1
480    GOTO 580
490    IF NOT(L>64 AND L<91 OR L>96 AND L
<123) THEN  GOTO 530
```

110-120	Reference of program source.
230	Effectively protect red and blue.
240	Get title followed by carriage return.
260	Get author for piece of text.
280	Print prompt.
300-350	Comments on the program.
360	Set flags to zero.
370	Get M, the number of words in the sample.
380	Set the counters to zero.
400	Begin to get letters from the keyboard.
410	Count letters.
420	Get letter from keyboard.
430	Print the letter on the screen without a carriage return (semi colon inhibits this).
440	If return has been entered then GOSUB and deal with it.
450	Check for punctuation marks.
460	Increment word count and set the appropriate flag, if end of word.
470	Check for end of sentence marker (!.?)
490	Check that letters input.

PCN Program Cards

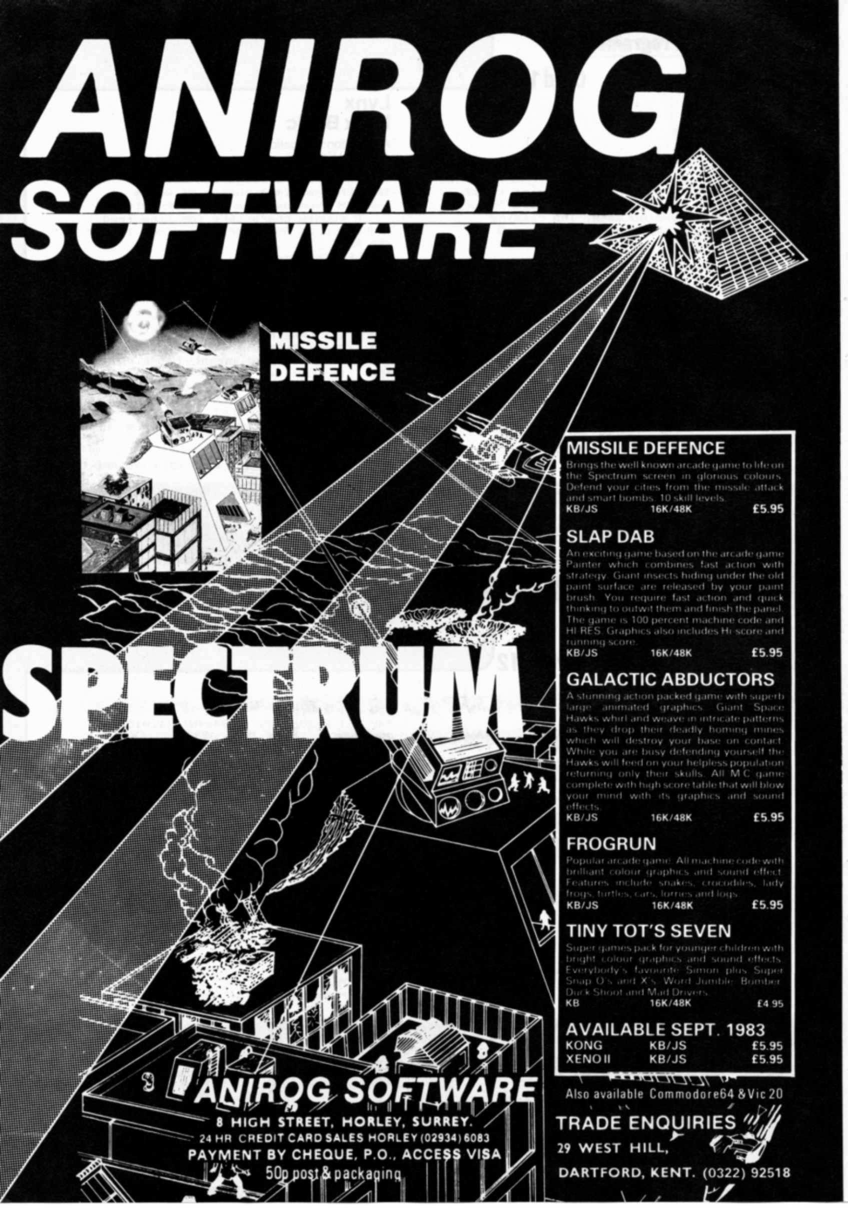
Readage

Card 2 of 2

Lynx
8329 RA2/2

```
500    LET P=P+1
510    LET G=0,F=0
520    GOTO 580
530    IF L<>8 THEN  GOTO 580
540    IF G THEN  LET S=S-1
550    IF F THEN  LET W=W-1
560    LET P=P-1,C=C-1
570    LET G=0,F=0  .
580    IF P/500=INT(P/500) THEN  CLS
590    IF C=39 OR (C>32 AND F) THEN  GOSU
B  LABEL PRINT
600 UNTIL P>=M AND G
610 REM
620 BEEP 120,500,63
630 WINDOW 0,123,175,245
640 VDU 23
650 REM
660 REM
670 LET H=INT(P/3.1)
680 PRINT T$,"by ";W$
690 PRINT W;" words, ";S;" sentences."
700 PRINT "Syllables estimated at ";H
710 REM
720 LET N=100*H/W
730 LET X=W/S
740 LET R=206.835-(0.846*N)-(1.015*X)
750 REM
760 PRINT "Reading ease score: ";R
770 REM
780 LET A$="10"
790 IF R<90 THEN  LET A$="11"
800 IF R<80 THEN  LET A$="12"
810 IF R<70 THEN  LET A$="13 to 14"
820 IF R<60 THEN  LET A$="15 to 18"
830 IF R<50 THEN  LET A$="18 to 21"
840 IF R<30 THEN  LET A$="over 21"
850 REM
860 PRINT "Reading age is ";A$;" years."
870 WINDOW 3,123,5,245
880 END
890 REM
900 LABEL PRINT
910 LET C=0
920 PRINT
930 RETURN
940 REM
950 REM set number of words in sample
960 DATA 300
```

500	Increment the number of letters.
510	Set flags to zero.
530	Is letter entered, delete?
540	If G flag is set then decrement the number of sentences.
550	If the F flag is set then decrement the number of words.
560	Decrement number of letters.
570	Reset flags.
580	If a multiple of 500 letters has been entered then clear the screen.
590	If line overflow imminent then GOSUB and print newline.
600	Check if M letters have been entered, if so then terminate the REPEAT UNTIL loop.
620	Make tone to signify completion of test.
630	Set up a window.
640	Home the cursor.
650-660	Pad out the program to make it more readable.
670	Estimate the number of syllables.
680	Print title and author.
690	Print number of words and sentences.
700	Print number of syllables.
720-750	Evaluate the reading ease.
760	Print reading ease.
780-850	Work out reading age from this.
860	Print reading age.
870	Return window to its normal dimensions.
900-930	Carriage return subroutine.


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An exciting game based on the arcade game Painter which combines fast action with strategy. Giant insects hiding under the old paint surface are released by your paint brush. You require fast action and quick thinking to outwit them and finish the panel. The game is 100 percent machine code and HI-RES. Graphics also includes Hi-score and running score.
KB/JS 16K/48K £5.95
GALACTIC ABDUCTORS
A stunning action packed game with superb large animated graphics. Giant Space Hawks whirl and weave in intricate patterns as they drop their deadly homing mines which will destroy your base on contact. While you are busy defending yourself the Hawks will feed on your helpless population returning only their skulls. All M C game complete with high score table that will blow your mind with its graphics and sound effects.
KB/JS 16K/48K £5.95
FROGRUN
Popular arcade game. All machine code with brilliant colour graphics and sound effect. Features include snakes, crocodiles, lady frogs, turtles, cars, lorries and logs.
KB/JS 16K/48K £5.95
TINY TOT'S SEVEN
Super games pack for younger children with bright colour graphics and sound effects. Everybody's favourite Simon plus Super Snap O's and X's. Word Jumble. Bomber. Duck Shoot and Mad Drivers.
KB 16K/48K £4.95
AVAILABLE SEPT. 1983
KONG KB/JS £5.95
XENO II KB/JS £5.95
ANIROG SOFTWARE
8 HIGH STREET, HORLEY, SURREY.
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29 WEST HILL,
DARTFORD, KENT. (0322) 92518

PCN Program Cards

Knockout Whist Card 3 of 4

ZX81 16K
8329 KW3/4

```
1240 IF C$(I+ST)(2)=M$(2) AND C(
I+ST)>NM AND C(I+ST)<TO THEN LET
 TO=C(I+ST)
1250 NEXT I
1260 IF TO<>15 THEN GOTO 1320
1270 FOR I=1 TO ST
1280 IF C$(I+ST)(2)=M$(2) AND C(
I+ST)<TO THEN LET R=I
1290 IF C$(I+ST)(2)=M$(2) AND C(
I+ST)<TO THEN LET TO=C(I+ST)
1300 NEXT I
1320 LET NC=C(R+ST)
1330 LET O$=C$(R+ST)
1340 LET C$(R+ST)="  "
1350 LET C(R+ST)=100
1360 LET X=2
1370 LET Y=R*4-2
1380 LET U$="    "
1390 GOSUB 9000
1400 LET U$="████"
1410 LET X=9
1420 LET Y=20
1430 GOSUB 9000
1440 PRINT AT X,Y;O$(2);AT X+2,Y
+1;O$(1)
1450 GOSUB 9200
1460 IF PTG=0 THEN GOTO 1540
1470 GOTO 1780
1500 REM * ME TO GO *
1510 PRINT AT 12,3;"YOU TO GO NE
XT"
1520 GOSUB 9200
1530 GOSUB 9050
1540 LET A$=INKEY$
1550 IF A$="" THEN GOTO 1540
1560 IF CODE A$<29 OR CODE A$>28
+ST THEN GOTO 1540
1570 LET NP=VAL A$
1580 IF C(NP)=100 THEN GOTO 1540
1590 IF PTG THEN GOTO 1640
1600 IF C$(NP)(2)=O$(2) THEN GOT
O 1640
1610 FOR I=1 TO ST
1620 IF C$(I)(2)=O$(2) THEN GOTO
 1540
1630 NEXT I
1640 LET U$="    "
1650 LET X=16
1660 LET Y=NP*4-2
1670 GOSUB 9000
1680 LET X=9
1690 LET Y=8
1700 LET U$="████"
1710 GOSUB 9000
1720 PRINT AT X,Y;C$(NP)(2);AT X
+2,Y+1;C$(NP)(1)
1730 LET NM=C(NP)
1740 LET C(NP)=100
1750 LET M$=C$(NP)
1760 LET C$(NP)="  "
1770 IF PTG THEN GOTO 1080
1780 REM * WHO WON *
1790 IF O$(2)=M$(2) THEN GOTO 18
40
1800 IF O$(2)=T$ THEN GOTO 3100
1810 IF M$(2)=T$ THEN GOTO 3000
1820 IF PTG=1 THEN GOTO 3000
1830 GOTO 3100
1840 IF NM>NC THEN GOTO 3000
1850 GOTO 3100
```

1020	Computer's go.	1120-1300	Computer sorts through it's cards and chooses which card to play.	1540-1570	Get card to play.
1030-1040	Wait and then remove the message from the screen.	1320-1470	Move cards around the table.	1580-1600	Check the card played to make sure it is valid.
1050	Computer chooses a card.	1510	Print message.	1610-1630	Check suit.
1060	If the card has been played then play another.	1520-1530	Do delay and then remove the message.	1640-1770	Move cards around the table.
1090-1110	Check through the cards for the suit.			1790-1850	See who the winner is.

PCN Program Cards

Knockout Whist Card 4 of 4

8329 KW4/4
ZX81 16K

```
3000 REM * ME WIN *
3010 GOSUB 9050
3020 LET TM=TM+1
3030 PRINT AT 0,29;TM
3040 PRINT AT 9,3;"YOU WON THAT
TRICK"
3050 LET PTG=1
3060 IF TM+TC=ST THEN GOTO 3200
3070 GOTO 1000
3100 REM * [illegible] *
3110 GOSUB 9050
3120 LET TC=TC+1
3130 PRINT AT 0,20;TC
3140 LET PTG=0
3150 PRINT AT 9,3;"I WON THAT TR
ICK"
3160 GOTO 3050
3200 REM * END OF THAT STAGE *
3210 IF TM=0 OR TC=0 THEN GOTO 3
500
3220 IF TC>TM THEN PRINT AT 12,3
;"I WILL CALL NEXT"
3230 IF TC>TM THEN LET PTG=0
3240 IF TM>TC THEN PRINT AT 12,3
;"YOU WILL CALL NEXT"
3250 IF TM>TC THEN LET PTG=1
3260 IF TM=TC THEN GOSUB 3350
3270 GOSUB 9200
3280 LET ST=ST-1
3290 LET CALL=(TM>TC)
3300 GOTO 60
3350 REM * CUT FOR WHO CALLS *
3360 PRINT AT 12,3;"WE WILL CUT
FOR WHO CALLS"
3370 GOSUB 9200
3380 GOSUB 9050
3390 LET R=INT (RND*9)+2
3400 LET R1=INT (RND*9)+2
3405 IF R=R1 THEN GOTO 3390
3410 PRINT AT 10,3;"I HAVE CUT A
 ";R,"YOU HAVE CUT A ";R1
3420 IF R>R1 THEN LET TC=TC+1
3430 IF R1>R THEN LET TM=TM+1
3440 GOTO 3200
3500 REM * END OF GAME *
3510 IF TM=0 THEN PRINT AT 12,3;
"I ";
3520 IF TC=0 THEN PRINT AT 12,3;
"YOU ";
3530 PRINT "HAVE WON THE GAME"
3540 GOSUB 9200
3550 GOSUB 9050
3560 PRINT AT 11,0;"DO YOU WANT
ANOTHER GAME","OF KNOCKOUT WHIST
 ?"
3570 IF INKEY$="" THEN GOTO 3570
3580 IF INKEY$="Y" THEN RUN
3590 PRINT ,,"  BE LIKE THAT TH
EN"
3600 GOSUB 9200
3610 NEW
8999 REM * SUBROUTINES *
9000 FOR J=0 TO 4
9010 PRINT AT X+J,Y;U$
9020 NEXT J
9030 RETURN
9050 PRINT AT 7,0;
9060 FOR J=1 TO 8
9070 PRINT Z$
9080 NEXT J
9090 RETURN
9100 IF SU=1 THEN LET S$="█"
9110 IF SU=2 THEN LET S$="█"
9120 IF SU=3 THEN LET S$="█"
9130 IF SU=4 THEN LET S$="█"
9140 RETURN
9200 FOR J=1 TO 20
9210 NEXT J
9220 RETURN
```

3000-3070	Player wins the trick.	3510-3550	Print winner.	9050-9090	Remove message from screen subroutine.
3100-3160	Computer wins the trick.	3560-3610	End program and NEW.		
3200-3300	See who calls trumps.	9000-9030	Place or remove card subroutine.	9100-9140	Assign suit to suit number.
3350-3440	Cuts the cards.			9200-9220	Delay subroutine.

Clubnet keeps you in touch with micro enthusiasts throughout the UK. It is divided into clubs and user groups and a list of each is published on alternate weeks.

This week it is the turn of user groups, which are listed alphabetically by machine and special interest.

If your association has something special on the agenda or if you're starting a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

The listings are based on that of the Association of Computer Clubs.

Our Clubnet Report this week focuses on the Rainham Atari Users Group.

Atari reigns in Rainham

When *PCN* visited the Rainham Atari Users Group, 16-year old Jason McEwan was working on his design for a musical keyboard to go with an 800.

'I've designed the prototype,' he said, 'and I'm now designing the software. I hope to finish it by the end of the year.'

For the future, organiser John Farrar would like to see programming meetings to enable the club to design its own software, with prices as low as £4.95.

The Atari Users Group meets on the second and fourth Friday of the month.

John Farrar bought his Atari 800 18 months ago and expected a copy of the company's *Input/Output* magazine to arrive. It did not, and indeed has not since, although John is listed in it as a group organiser.

So he decided to go it alone and a year ago, with a borrowed *I/O*, he phoned 10 of the people listed in the magazine. A meeting was arranged but only three people turned up.

John then decided on a new tack — phoning people from registration cards from local dealers — and this has proved a considerable success, attracting 15 new members.

'If the club was to grow any larger, we'd need bigger premises,' he says.

Although Atari has apparently proved unhelpful in encouraging the group, a great deal of assistance has been obtained from Jim Wingfield of Your Home Entertainment Atari Centre at 212-213 Broad Street, Birmingham, who regularly sends information about new products.

Membership of the group costs £10 for a family, £7.50 for an adult, £2.50 for the under-18s and students and there is a 25p charge for each machine at the meetings, which goes towards electricity.

Janice McKenzie



Software design is on schedule.

Name Rainham Atari Users Group **Venue** Rainham Town Football Club, Wennington Road, Rainham, Essex **Meetings** Second and fourth Friday of the month **Contact** John Farrar, Rainham 22077.

CLUBS

Acorn

Coventry Acorn Atom User Group. Peter Frost, 18 Frankwell Drive, Coventry, 0203 613156.

Kent Medway Acorn User Group. Meets at St John Fisher School on last Monday of month at 7pm. Sessions at 9pm Thursday at the Fox and Hound, Chatham. Clem Rutler, c/o St John's Fisher School, Ordance Street, Chatham, Kent, 0634 42811 (day), 0634 373459 (evenings).

Manchester Acorn User Group. Meets at AMC, Crescent Road, Crupsall, Manchester 8 on Tuesday except school holidays. John Ashurst, 192 Vendure Close, Failsworth, Manchester, 061-681 4962.

Apple

Ashtead Appler User Group. Meets first Monday of every month. Contact M Lawrence, 15 Petters Road, Ashtead, Surrey.

British Apple Systems User Group, PO Box 174, Watford WD2 6NF.

British Apple Systems User Group. Meets first Tuesday evening and third Sunday afternoon every month at Old School, Branch Road, Park Street, St Albans. Subs: £12.50+£2.50 joining. Contact D Bolton, 0727 72917.

Birmingham & Region Apple Group. Contact Mel Golder, 021-426 2275.

Bristol Apple Users and Dabblers. Meets at 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, once a month. Ewa Dabkowski, c/o Datalink, 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, 0272 213427.

Buckinghamshire Apple User Group. Steve Profitt, The Granary, Hill Farm Road, Marlow Bottom, Buckinghamshire, 062 84 73074.

Chelmsford Apple Users Club. Proposed new club. Contact D Beckingham, 571 Galleywood Road, Chelmsford, tel: Chelmsford 66948.

Croydon Apple User Group. Meets at Sidda House, 350 Lower Addiscombe Road, Croydon, on second Monday of month. Paul Vernon, 60 Flawkhurst Way, West Wickham, Kent, 01-777 5478.

London Apple Music Synthesis Group. Dr Davis Ellis, 22 Lennox Gardens, London SW1.

South-East London Apple User Group (Appletree). Contact John Grieve at 106 Maran Way, Erith, Kent or phone 01-311 7681.

Milton Keynes Microcomputer User Group. Meets every Tuesday, 7.30pm. Brian Pain, Sir Frank Markham School, Woughton Centre, Chaffron Way, Milton Keynes.

Atari

Birmingham User Group. Meets at the Malaga Grill, Matador Public House, Bull Ring shopping centre, Birmingham, on second and fourth Thursday every month at 7.30pm. Mike Aston, 42 Short Street, Wednesbury, West Midlands.

Carshalton Atari User Club. Paul Deegan, 01-642 5232.

South Cheshire Atari User Group. Meets at the Earl of Crewe, Nantwich Road, Crewe, on first Thursday of each month at 7.30pm. Contact A Davies, 48 Blagg Lane, Nantwich, Cheshire, 0270 626969.

Essex. Contact John Sarrar, 138 Frederick Road, Rainham, Essex, tel (76) 22077. Meets at Rainham Town Football Club, 7.30pm, second and fourth Friday of each month.

Hull Atari Users Local Group. Harvey Kong Til, 546 Holderness Road, Hull HU9 3ES. Hull 7911094.

London Silica Atari 400/800 User Club. Richard Hawes, 01-301 1111.

Manchester Atari Computer Enthusiasts. Meets at The Ellesmere, Worsley Road, Worsley, on the second and last Thursday of every month. Contact Martin Davies, Bolton 700757.

South Middlesex Atari Club. Meets fortnightly, Tuesdays, at Staines Methodist Church Hall, Kingston Road, Staines. Contact Brian Milligan, 50 Linkscroft Avenue, Middelesex. Tel: Ashford (69) 45387.

Norwich Atari User Group. Ken Ward, Norwich 661149.

Preston Atari Computer Enthusiasts. Meets at KSC Club, Merrion House, Beach Grove, Ashton, Preston, on third Thursday of month at 7.30pm. Roger Taylor, 0253 738192.

UK Atari Computer Owners Club. Contact PO Box 3, Raleigh, Essex.

Atom

Liverpool BBC and Atom User Group. Meets at Old Swan Technical College, Room C33 on first Wednesday of month at 7.30pm and at Birkenhead Technical College on third Thursday of month at 7.30pm. Nick Kelly 051-525 2934 (evenings).

BBC

Laserbug is an international user group for the BBC micro. Paul Barbour, 10 Dawley Ride, Colnbrook, Slough, Berks, 02812 30614.

Beebug. Sheridan Williams or David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR.

Bournemouth BBC User Group. Meets at Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth on first and fourth Wednesday of month at 7.30pm. Norman Carey, 0202 749612.

Brent/Barnet User Group. Meets on last Sunday of month. Joseph Fox, 4 Harman Close, London NW2 2EA.

Charlton & District (South Manchester) BBC Micro User Group. Contact Philip Harrison, 34 Holwood Drive, Manchester M16 8WS.

Chelmbug. Contact Ian on Chelmsford 69174.

Cardiff BBC Microcomputer Club. Meets alternate Wednesdays at Applied Science Lecture Theatre, University College, Newport Road, Cardiff.

Format 40/80 Club (BBC Disk User Group). Send SAE to Peter Hughes, Five Marsh Street, Bristol BS1 4AA.

Liverpool BBC & Atom Group. Meets on the first Wednesday of every month at Old Swan Technical College, Room C33, 7.30-9.30pm, and on the third Thursday at Birkenhead Tech. College, 7.30-9.30pm. Contact Nik Kelly, 56 Queens Drive, Walton, Liverpool L4 6SH.

North London BBC Micro Users Group. Meets at The Prince of Wales, 37 Fortune Green Road, on Tuesdays at 7pm. Dr Leo McLaughlin, Westfield College, University of London, Kidderpore Avenue, London NW3 7ST, 01-435 0109.

Norwich & District BBC Microcomputer User Group. Meets at Norwich City College on the first and third Tuesday of every month at 7pm. Subs: £3; students and OAPs £1.50. Contact Paul Beverley, Department of Electronics, Norwich City College, Ipswich Road, Norwich NR2 2LJ.

Preston area BBC Micro User Group. Meets at Boatmans Arms, Marsh Lane, Preston, on last Thursday of month. Duncan Coulter, 8 Briar Grove, Ingol, Preston, Lancashire, 0772 725793.

Tyne & Wear BBC User Club. Contact Ian Waugh, 13 Briardene Drive, Wardley, Tyne & Wear NE10 8AN.

Wakefield BBC Micro User Group. Meets at Holmfield House, Clarence Park, Wakefield, on first Wednesday of each month at 7.30pm. Contact R Bilton tel: Wakefield 382274.

Wellingborough BBC Owners User Group. Contact R Houghton, 49 Addington Road, Irthlingborough.

Witham (NAMEBUG) BBC Micro User Group. Meets at comprehensive school, Witham on second Thursday each month at 7.30pm. Dave Watts 0245 358127 after 7pm.

Basic

Welwyn Basic User Group meets at Campus West Library, Welwyn Garden City, Herts, on last Friday of each month at 7pm. Contact Debi Colthorpe, 36 Birds Close, Welwyn Garden City, Herts, 96 30082.

Comal

London Comal User Group. Meets at Polytechnic of North London, Holloway, second Wednesday of month, term time. John Collins, 75 74111.

Commodore ICPUG

Basildon. Contact Walter Green, 151 The Hatherley, Basildon, Essex.

Bloxham. Contact John Temple, Kirabanda, Rose Bank, Bloxham, Oxon.

Barnsley. Bob Wool, 13 Ward Green, Barnsley, South Yorkshire, 0226 85084.

Blackpool. Meets at Arnold School, Blackpool, on third Thursday of month. David Jarrett, 197 Victoria Road, Thornton Cleveleys, Blackpool FY5 3ST.

Birmingham. Contact J A McKain, PPI Ltd, 177 Lozells Road, Birmingham, tel: 021-544 0202.
Bournemouth & Poole. Contact Douglas Shave, 97 Canford Cliffs Road, Poole, Dorset BH13 7EP.
Bury St Edmunds. Contact Alan Morris, 30 Kelso Road, Bury St Edmunds, Suffolk.
Burnley. Contact John Ingham, 72 Ardwick Street, Burnley, Lancashire.
Canterbury SE. Meets at The Physics Lab, Canterbury University, on first Tuesday and Wednesday of month. R Moseley, Rosemount, Romney Hill, Maidstone, 0622 37643.
Carrickfergus. David Bolton, 19 Carrickburn Road, Carrickfergus, Antrim BT38 7ND, 09603 63788.
Chelmsford. Contact A G Surridge, 97 Shelley Road, Chelmsford, Essex.
Cheltenham. Meets at the Cheltenham Ladies College on last Thursday of month at 7.30pm. Alison Schofield, 78 Hesters Way Road, Cheltenham, Gloucester, 0242 580789.
Clwyd. John Poole, 6 Ridgway Close, Connah's Quay, Clwyd CH5 4LZ.
Corby. Peter Ashby, 215 Wincohn Way, Corby, Northamptonshire, 05363 4442.
Coventry. Meets at Stoke Park School and County College at 7pm on fourth Wednesday of month except July, August, December. Will Light, 22 Ivybridge Road, Stvyechale, Coventry, Warwickshire.
Derby. Meets at Derby Professional Colour every other Tuesday at 7pm. Robert Watts, 03322 72569.
Derbyshire & District. Meets every other Monday 7-9pm at Davidson Richards Ltd, 14 Dufflied Road, Derby. Contact Raymond Davies, 105 Normanton Road, Derby DE1 2GG.
Devon. Contact Matthew Stibbe, The Lawn, Lower Woodfield Road, Torquay, Devon.
Durham. North-East Pet and ICPUG. Meets at Lawson School, Burnley at 7pm second and third Mondays. Jim Cocallis, 20 Worcester Road, Newton Hall Estate, Durham, 0385 67045.
Dyfed. Simon Kniveton, 097 086 303.
Gosport. Meets at Bury House, Bury Road, Gosport, Hants at 7pm. Contact Tony Cox, 10 Staplers Reach, Rowner, Gosport, Hants.
Hainault. Meets at Grange Remedial Centre, Woodman Path, Hainault. Carol Taylor, 101 Courtlands Avenue, Cranbrook, Ilford, Essex.
Glasgow. Dr Jim MacBrayne, 27 Daidmyre Crescent, Newton Mearns. Glasgow, 041-639 5696.
Gloucester and Bristol Area. Meets last Friday of each month. Contact Janet Rich, 20 Old Court, Spring Hill, Cam, Gloucester.
Hampshire. Meets at 70 Reading Road, Farnborough, on third Wednesday of month. Ron Geere, 109 York Road, Farnborough, Hants, 0252 542921.
Gosport. Contact Brian Cox, Bury House, Bury Road, Gosport, Hants, Fairham 280539.
Hants. Contact Tony Cooke, 7 Russell Way, Petersfield, Hampshire GU31 4LD.
Hertfordshire North. Meets at Provident Mutual Assurance, Purwell Lane, Hitchin, on last Wednesday of month. B Grainger, 73 Minehead Way, Stevenage, Herts SG1 2HS, 0438 727925.
Kilmarnock. Meets at Symington Primary School on first and third Thursday of month at 7pm. John Smith, 19 Brewlands Road, Symington, Kilmarnock KA1 5RW, 0563 830407.
Liverpool. Meets at The Merchant Taylor School for Boys, Crosby, on second Thursday of month at 7pm. Tony Bond, 27 Ince Road, Liverpool L23 4UE, 051-924 1505.
Llandyssul. Contact F Townsend, The Hill, Rhydowen, Llandyssul, 05455 5291.
London. Alan Birks, 135 Queen Alexandra Mansions, Judd Street, London WC1, 01-430 8025.
London North. Barry Miles, Department of Business Studies, North London Polytechnic, Holloway Road, London N7, 01-607 2789.
Maidstone. Meets on the first Wednesday of every month contact Ron Moseley, Lord Romney Hill, Weavering Maidstone, Kent, 0622 37643.
Manchester. Contact Clive Embrey, 17 Santon Avenue, Fallow Field, Manchester.
Mapperley. Meets at Arnold & Carlton College, Digby Avenue, Mapperley every Friday. Contact Mark Graves, 8 Digby Hall Drive, Gunthorpe Road, Gedling, Notts NG4 4JT.
Merseyside. Meets fortnightly. Contact P Leather, 27 St Luke's Drive, Formby, Merseyside, tel: 36 74694.
National. Contact Membership Secretary, 30 Brancoates Road, Newbury Park, Ilford, Essex 1G23 7EP.
Norfolk. Proposed new club. Contact J Blair, 7 Beach Road, Cromer, Norfolk.
Norfolk. Peter Petts, Bramley Hale, Wretton, King's Lynn, Norfolk PE33 9QS, 0366 500692.
Northampton. Contact Peter Ashby, 215 Lincoln Way, Corby, Northants.
Northern Ireland. Meets last Wednesday of each month. Contact David Weddell, 9 Upper Cavehill Road, Belfast BT15 5EZ, 0232-711580.
Northumberland. Graham Saunders, 22 Front Street, Guide Post, Northumberland.
Rhyl. Contact Frank Jones, 77 Millbank Road, Rhyl, Clywd, 0745 54820.
Slough. Meets at Slough College on second Thursday of month at 7.30pm. Brian Jones, 53 Beechwood Avenue, Woodley, Reading RG5 3DF, 0734 661494.
South-East. Regional Group. Meets at Charles Darwin School, Jail Lane, Biggin Hill, Kent, on third and fourth Thursday of month at 7.30pm. Jack Cohen, 30 Brancaster Road, Newbury Park, Ilford, Essex, 01-597 1229.
South Midlands. Meets at 12 York Street, Stourport-on-Severn on last Thursday of month. M J Merriman at above address.
Staffordshire. 57 Clough Hall Road, Kidsgrove, Stoke-on-Trent.
Stourport-on-Severn. Meets last Thursday of each month. Contact M Merriman, 12 York Street, Stourport.
Teddington. G Squibb, 108 Teddington Park Road, Teddington, Middlesex, 01-977 2346.
Watford. Meets on second Monday of month. Stephen Rabagtiati, c/o Institute of Grocery Dist. Grange Lane, Letchmore Heath, Watford, Herts, 01-779 7141.**Witney.** Contact Ian Blyth, 40 Wilmot Close, Witney 5171.
Wolverhampton. Meets monthly. Contact J Bowman, 6 The Oval, Albrighton, Wolverhampton, West Midlands.

Commodore Pet

Blackpool. West Lancashire Pet Users Club. Meets at Arnold School, Blackpool on the third Thursday of month. D Jowett, 197 Victoria Road, East Thornton, Blackpool FY5 35T.
Southern Users of Pets Association. Howard Pilgrim, 42 Compton Road, Brighton BN1 5AN.
Pet User Group Crawley. Richard Dyer, 33 Parham Road, Ilfield, Crawley.
Pet Users Education Group. Dr Chris Smith, Department of Physiology, Queen Elizabeth College, Camden Hill Road, London W8 7AH.
UK Pet Users Club. 360 Euston Road, London NW1 3BL.
Pet Users Group. Meets at Polytechnic of North London, Eden Grove, Room 320. On alternate Tuesdays, 6pm. Barry Miles 01-607 2789.
Pet User Club. Margaret Gulliford, 818 Leigh Road, Slough Industrial Estate, 0753 74111.
Independent Pet Users Group. 57 Clough Hall Road, Kielsgrove, Stoke-on-Trent, Staffordshire.

Commodore Vic

National Association of Vic-20 Owners. Contact S Tomananek, 20 Milner Road, Sherwood, Nottingham.
Burnley. John Ingham, 72 Ardwick Street, Burnley, Lancashire.
Clwyd. Contact A Stanners, 192A Willow Park, Queensferry, Deeside, Clwyd, Wales, 816603.
London. Vic Users Group. Meets on alternate Tuesdays at 6.30pm at Polytechnic of North London, Community Centre. Robin Bradbeer.
London. Contact Jim Chambers, Department of Psychology, University College London, Gower Street, London, WC1, 01-387 7050 x 413. Meets at University College, 26 Bedford Way, London WC1, third Tuesday of each month at 8pm.
Norfolk. J Blair, 7 Beach Road, Cromer, Norfolk, 0263 512849.

Compucolour

Caversham. Compucolour Users Group UK. Meets at Community Centre, Caversham Park Village twice a year. Peter Hiner, 11 Pennycroft, Harpenden, Hertfordshire, 05827 64872.

CP/M

Irish CP/M Users Group. Meets monthly in Dublin area. Doug Notley, Gardner House, Ballsbridge, Dublin 4, Dublin 686411.
London. CP/M User Group (UK). Subs £7.50. Produces newsletter. Contact David Powys-Lybbe, 01-247 0691.
UK CP/M Users Group. Lesley Spicer, 11 Sun Street, London EC2M 2QD, 01-247 0691.

COSMAC

COSMAC Users Group. James Cunningham, 7 Harrowden Court, Harrowden Road, Luton, Bedfordshire, 0582 423934.

Decus

Decus UK & Ireland. Contact Tracey Pardoe, DECUS, PO Box 53. Reading, Berks RG2 0TW.

Digital Equipment

Digital Equipment Users Society. The Secretary, PO Box 53, Reading, Berkshire, 0734 387725.

Dragon

Brixham Dragon Owners Club. Meets at Computer Systems (Torbay), Pump Street, Brixham, every Saturday at 2.30pm. Ian Chipperfield, 22 Brookdale Court, Brixham, Devon, Brixham 59224.
Greater Manchester. Contact Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancs.

Epson HX20

London. Contact Terence Ronson, 25 Sawyers Lawn, Drayton Bridge Road, Ealing, W13, 01-998 1494.
Luton. The Dragon's Den. Contact D Buckingham, 83 Neville Road, Limbury, Luton, Beds.

Education

Birmingham. Education ZX80/81 User Group. Eric Deeson, Highgate School, Balsall Heath Road, Highgate, Birmingham B12 9DS.
Birmingham. MUSE. National body for co-ordinating activity in schools, colleges. Lorraine Boyce, MUSE Information Office, Westhill College, Weoley Park Road, Birmingham, 021- 471 3723.
Dublin. Computer Education Society of Ireland. Dairmuid McCarthy, 7 St Kevins Park, Kilmacud, Blackrock, Co. Dublin.
Middlesex. Educational Users Group. Offshoot of National TRS-80 Users Group. Dave Fletcher, Head Teacher, Beaconsfield First and Middle School, Beaconsfield Road, Southall, Middlesex.

Worcestershire. Mini and Microcomputer Users in Education. National organisation. R Trigger, 48 Chadcote Way, Catshill, Bromsgrove, Worcestershire B61 0JT.

Forth

Forth Users Group. David Husband, 2 Gorleston Road, Branksome, Poole, Dorset BH12 1NW, 0202 764724.
Forth Interest Group UK. Meets at Room 408, South Bank Polytechnic London SE1 on the first Thursday of the month. Contact K Goldie-Morrison, Bradden Old Rectory, Towcester, Northants.

Forum

Forum 80 Users Group. Frederick Brown, 421 Endike Lane, Hull HU6 8AG.

FX-500P

FX-500-P Users Association. Max Francis, 38 Grymsdyke, Great Missenden, Buckinghamshire HP16 0LP.

Genealogists

Society of Genealogists Computer Interest Group. Anthony Camp, 01-373 7054.

Genie

Colour Genie User Group. Details of meetings/membership from Pat Doohan, secretary, Nottingham (0602) 278791.

Intel MDS

UK Intel MDS Users Group. Lewis Hard, c/o S.P.A.C.E., The Old Coach House, Court Row, Upton-on-Severn, Worcester WR8 0NS.

Ithaca Audio S100

Ithaca Audio S100 Users Group. Dave Weaver, 41 Dore Avenue, North Hykenham, Lincoln LN6 8LN.

Jupiter Ace

Jupiter Ace Users Group. John Noyce, Remsoft, 18 George Street, Brighton BN2 1RH.

Lynx

National Independent User-Group. Subs £9. Contact Robert Poat, 53 Kingswood Avenue, Sanderstead, South Croydon CR2 9DQ.

Mattel

Mattel Intellivision TV Game Group. Warrington 62215 after 4pm.

Medical

Durham. Primary Health Care Group. Dr Alastair Malcolm, British Computer Society, Cheveley Park Medical Centre, Belmont, Durham, 0385 64282.
London. Medical Micro Users Group. Medicom, 1-2 Hanover Street, London W1.
Middlesex. TRS-80 Medical and Laboratory Users. Dr Robinson, The Residency, Northwick Park Hospital, Harrow, Middlesex.

Micronet

Micronet Independent User Group. Contact George Foot, Prestel Mailbox No. 892852867.

Nascom

Berkshire. Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Mike Rothery, 37 Eaton Wick Road, Eton Wick, Windsor, Berkshire, Windsor 56106.
Birmingham Nascom User Group. Meets at Davenports Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Martin Sidebotham, 021-744 3093.
International Nascom Microcomputer Club. 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP6 5EQ.
Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Mr T Searle, 051-526 5256.

Newbrain

Wakefield Independent Newbrain User

70▶

◀69

Group. Anthony Hodge, 15 St John's Court, Wakefield WF1 2RY.
Welwyn. Contact Angela Watkiss, 4 Ninnings Lane, Rabley Heath, Welwyn, Herts AL6 9TD.

Ohio
Ohio Scientific User Group. Tom Graves, 19a West End, Street, Somerset, 0458 45359.

Oric
Oric Owners Group. Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.
Kent. Contact Roger Pyatt, 23 Arundel Drive, Orpington, Kent with SAE or call 66 20281.
Strathkelvin Oric 1 User Group. Contact Colin Failes on 041-776 3654, or SAE to him at 24 Muirside Ave, Kirkintilloch, Glasgow G66 3PR.

Osborne
British Osborne Owners Group. J Anglesea, Flat 19, Rowan House, Mitton Road, Handsworth, Birmingham B20 2JR.

OSI
OSI UK User Group. Richard Elen, 12 Bennerley Road, London SW11 6DS.

Pascal
Pascal User Group. Nick Hughes, PO Box 52, Pinner, Middlesex HA5 3FE.

PDP
Buckinghamshire. PDP8 User Group. Nigel Dunn, 21 Campion Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.
Hertfordshire. PDP11 User Group. Pete Harris, 119 Carpenter Way, Potters Bar, Hertfordshire EN6 5QB, 0707 52091.

Pilot
UK Pilot User Group. Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside LG3 3AQ.

Prestel
ACC National Prestel Committee. Administrates Club Spot 800 (hobbyists on Prestel). Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines
Birmingham. Research Machines 380Z Peter Smith, Birmingham Educational Computing Centre, Camp Hill Teachers Centre, Stratford Road, Birmingham B11 1AR.
Leamington Spa. West Midland RML User Group. Spencer Instone, c/o 59 Avenue Road, Leamington Spa.
Newcastle. NERML 380Z User Group. Meets monthly at Micro-Electronics Education Centre of the Polytechnic Coach Lane Campus. Mr Hatfield or Mr Reed, Computer Unit, Northumberland Building, Newcastle Polytechnic, 0632 326002.
Oxford. Research Machines Ltd National User Group. Barry Mawer, 0704 24457.
West Midlands RML User Group. Contact 0926 38751.

Sharp MZ80
Aberdeen. International Sharp Users Group. Graham Knight, c/o Knights Computers, 108 Rossemount Place, Aberdeen, 0224 630526.
Essex. Sharp MZ80K User Group. Joe Street, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE.
Leeds. Sharp PC1211 Users Club. Jonathan Dakeyne, 281 Lidgett Lane, Leeds LS17 3AQ.
Somerset. Sharp MZ80 Users Club. Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.

Sinclair
Aylesbury. Sinclair ZX Computer Club. Ken Knight, 0296 5181.
Brighton. ZX Users Group. J Ireland-Hill Jnr, 145 Godwin Road, Hove, Brighton.
Colchester Sinclair User Group. Meets fortnightly. Richard Lawn, 102 Pettygate Road, Colchester, Essex.
Cardiff. ZX Club. Meets on last Sunday of month, 2pm. Mike Hayes, 54 Oakley Place, Grangetown, Cardiff, 0222 371732.
Doncaster & District Sinclair User Group meets at St Andrews Hall, Morley Road, Wheatley, Doncaster, every Wednesday except the first in each month. Contact John Woods, Doncaster 29357.
Edinburgh. ZX. Meets at Claremont Hotel, Claremont Crescent, Edinburgh, on second and fourth Wednesdays every month, 7.30pm. John Palmer, 56 Meadowfield Drive, Edinburgh, 031-661 3183.
Essex. Contact M Burnett, 24 Inverness Drive, Hainault, Ilford, Essex.
Glasgow. ZX80/81 User Group. Ian Watt, 10 Greenwood Road, Clarkston, Glasgow, 041-638 1241.
Liverpool. ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Keith Archer, 051-260 4950.
London. National ZX User Club. Tim Hartnell, Interface, 44-48 Earls Court, London W8.
London. Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block. Monday, 6.30pm. Irving Brand, Polytechnic of North London, Holloway Road, London.
Manchester Sinclair Users Club. Meets at Longsight Library, 519 Stockport Road, Longsight, Manchester, every Wednesday at 7.30pm. Call 061-225 6997 or 061-445 6316.
ZX Spectrum Club. D Beattie, 63 Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.
Scunthorpe. Grange Farm ZX Computer Club, Scunthorpe, South Humberside. Meets first and third Tuesday of month. Contact Sheila & Fred Wilkinson, 0724 842970.
Staffordshire. ZX80 National Software Association. 15 Woodlands Road, Wombourne, Staffordshire WV5 0JZ.
Suffolk. ZX Amateur Radio User Group. Paul Newsman, 3 Red House Lane, Leiston, Suffolk, SAE essential. No telephone inquiries.
Surrey. Guildford ZX80/81 Users Group. Meets Fridays. A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0483 62035.
Surrey. ZX80/81 User Club. David Bigden, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.
West Sussex. Hassocks ZX Micro User Club. Paul King, 25 Fir Tree Way, Hassocks, West Sussex.

Sirius
Sirius User Group. Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 7-71 Gordon Street, Luton, 0582 412215.

68XX
68XX Special Interest Group, meets third Tuesday of each month. Contact Jim Anderson, 01-422 4724.

6809 User Group
6809 User Group. Produce bi-monthly newsletter. Contact Mr Gibbons, Clarence Lodge, Hurdon Road, Launceston, Cornwall PL15 9DB.

Software
London. Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursday, 6pm. Mike Duck at Polytechnic of North London, Holloway, London N7.
Oxford. Program of the Month Club. Mr Durrant, 55 St Thomas Street, Oxford OX1 1JG, 0855 250333.

Sorcerer
Liverpool European Sorcerer Club. Monthly meetings. Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3JU, 07048 72137.
Surrey. Exidy Sorcerer User Group. Andy Marshall, 44 Arthurs Bridge Road, Woking, Surrey GU21 4NT.

Spreadsheet
International Electronic Spreadsheet Users Group. UK Alpha House, 7th Floor, Rowlandsway, Manchester M22 5RG.

Tandy
Tandy Model 100 User Group. SAE to Remsoft, 18 George Street, Brighton, tel: 0273 602354.

Tangerine
Avon. Tangerine Users Group. Bob Green, 1 Marlborough Drive, Worle, Avon, 0934 21315.
Bristol. Tangerine Homebrew. A Coales, 35 Mogg Street, St Werburghs, Bristol BS2 9UB.

Texas Instruments
Brighton. Contact Clive & Audrey Scally, 40 Barrhill, Patcham, Brighton, Sussex.
Ireland. Proposed new club. Contact Mrs Ann Flynn, 53 Georgian Close, North Road, Drogheda, Co. Louth, Eire.
Leeds. TI99/4A User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. I Youlden, 0532 401408.
Manchester. TI User Group. T Grimshaw, 21 Allingham Street, Longsight, Manchester.
Manchester. TI9900 User Group. Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.
Nationwide TI Users Group. Contact TI99/4A Exchange, Independent TI Users, 40 Barrhill, Patcham, Brighton BN1 8UF.

Triton
Triton User Group. Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.

TRS-80
Birmingham. National TRS-80 User Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on last Friday of month. Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.
Chelmsford. TRS-80 User Group. Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.
Durham. North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. J Dunn, 8 Ettrich Terrace, North Gateshead, County Durham.
Edinburgh. Scottish TRS-80 and Genie User Group. Meets at Mansion House Hotel, Milton Road, second Thursdays of month. Dick Mackie, 72 Morningside Drive, Edinburgh EH9 1DX, 031-447 6651.
Herts. Contact Reg Smith, 24 Sempill Road, Hemel Hempstead, Herts, 0442 60085.
Hull & District TRS-80/Beeb Users Group. Meets second Tuesday of month and Thursday 16 days later at Psychology Dpt, Hull University. Contact J Lawrence, 2a Hall Road, Hull HU6 8SA.
Isle of Wight. TRS-80 User Club. Meets at London Hotel, Ryde on last Friday of month. 7.30pm. Sean Coulson, 0903 614589.
Kent. TRS-80 User Group. Alan Reid, 22 Woodeys Road, Rainham, Kent, 0634 367012.
Greater Manchester. Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm. Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancs.
Lancs. TRS-80 Colour Computer Group. Subs: £3. Contact Ian Wild, 53 Darnton Road, Ashton-U-Lyne, Lancs OL6 6RL.
Liverpool. Merseyside TRS -80/Video Genie User Group. Meets second Thursday of month. 7.15pm. Peter Toothill, 101 Swanside Road, Liverpool L14 7NL. 051-220 9733.
London, SW. TRS-80 User Group. Ron Everitt on 01-394 2123.
Merseyside. TRS-80 User Group. N Rushton, 123 Roughwood Drive, Northwood, Kirby, Merseyside.
Milton Keynes. National TRS-80 and Genie User Group. Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.
Nottingham. TRS-80 Genie Users Group. Meets at Wilford Moderns Rugby Club House on first and third Wednesday every month at 7.30pm. Contact Geoffrey Hillier, 5a Gregory Street, Lenton, Nottingham NG7 2LR, Nottingham 783938.
Nottingham. East Midlands TRS-80 User Group. Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham NG5 5BU, 0602 751753.
London. TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Dr Nick Robinson, Central Room, The Residency, Northwich Park Hospital.
Northants. TRS-80 User Group. Meets at Welwyn Park Community Centre on alternate Thursdays at 7pm. Neil Griffiths, 0858 65718.
West Herts 80 User Group. Meets at St Stephen's Parish Centre, Station Road, Bricket Wood, St Albans, Herts. Tuesday evenings fortnightly. Contact Reg Smith, 24 Sempill Road, Hemel Hempstead.

Colour Genie
International Colour Genie Users Group. Write with SAE to The Secretary, NCGUG, 46 Highbury Avenue, Bulwell, Nottingham, 0602 278791.
National Colour Genie User Group. Marc Leduc, 46 Highbury Avenue, Nottinghamshire NG6 9DB.

UCSD
Hants. UCSD System Users Society. John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG2 0QB.
Oxford. UCSD Pascal UK Users Group. Malcolm Harper, Oxford University Computing Laboratory Programming Research Group, 45 Banbury Road, Oxford OX2 6PE.

CUA
CUA User Group. Adrian Waters, 9 Moss Lane, Romford, Essex.

6502
Bedfordshire. 6502 User Group. Walter Wallenborn, 21 Argyll Avenue, Luton, Bedfordshire LU3 1EG, 0582 26927.
Hants. 6502 User Group (Southern Region). Steve Cole, 70 Sydney Road, Gosport, Hants.

Let us know about your micro club or user group so we can be sure the information printed here is up to date. Drop a card to Wendie Pearson, Listings Editor, at *Personal Computer News*, 62 Oxford Street, London W1A 2HG, or give her a call on 01-636 6890.

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PCN Databasics is presented in three-week cycles. This week it's the turn of software packages, next week hardware, and two weeks from now, peripherals.. We can't fit all software packages in, so we've compiled a selection, giving best sellers from 100 publishers and distributors.

We confined coverage to five main types of applications: business, education, games, home and utility. All details published are the latest available.

Companies wanting to add their best-selling packages to Databasics, or wanting to update information already here, should send details to: Databasics, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

APPLICATION Each software package is listed alphabetically by its application.
PRICE includes VAT.
MACHINE/OPERATING SYSTEM on which the best selling packages runs.
OTHER VERSIONS indicates whether or not the package runs on a different machine or operating system.
MEDIA SUPPLIED indicates in what format the package comes — either cassette, disk, or cartridge.
MAIL ORDER AVAILABLE tells you whether or not the package is available by mail order.
HARDWARE REQUIRED shows the need for special hardware, such as disk drive, ioystick or printer.
PUBLISHER/DISTRIBUTOR This code refers to the distributor code table at the end of the listings, which will give the name and telephone number of the publisher/distributor.
COMMENTS — any other points of interest.

SOFTWARE

BUSINESS

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied: Cassette	Media Supplied: Disk	Media Supplied: Cartridge	Mail order avail.	Hardware Required: Disk drive	Hardware Required: Joystick	Hardware Required: Other	Publisher/ Distributor	Comments
Accounting	£3,320	Apple II	●	Financial Controller	48K		●			●			S1	Also on Apple IIE. 8 modules (£402.50 each) — sales, purchase, invoicing, etc.
	£339.25	Apple II		General Ledger	48K		●		●	●			C1	Supports 1000 accounts and 100 analyses. Self-balancing, full audit trail.
	£552	Apple II		Informex Integrated Accounting System	48K		●		●	●			I1	Contains nominal, sales, purchase ledger + VAT. Can handle 800 accounts.
	£1,147.70	Apple II		Informex Integrated Business System	48K		●		●	●			I1	Contains accounting system modules plus invoicing + stock.
	£172.50	Apple II	●	Micro-General Ledger	48K		●		●	●			G1	Also on ITT 3030 and Basis 108. Goes through profit/loss + balance sheets.
	£402.50	Apple II	●	Nominal Ledger	64K		●			●		●	J1	Also on Sirius, IBM PC, Apple III + UCSD. Requires 132 column printer.
	£431.25	Apple II		Payroll	48K		●		●	●			C1	Supports weekly, monthly, + per monthly. Up to 350 employees per disk.
	£402.50	Apple II	●	Purchase Accounting & Cost Control	64K		●			●		●	J1	Requires 132 column printer, also Sirius, IBM PC, Apple III, UCSD.
	£402.50	Apple II	●	Sales Accounting System	64K		●			●			J1	Also on Sirius, IBM PC, UCSD. Provides conventional ledger.
	£339.25	Apple II		Sales Ledger	48K		●		●	●			C1	Supports 700 + accounts. Direct posting, credit control & 100 analyses, self balancing
	£1,725	Commodore 8000	●	Auditman	32K		●		●				C4	Also on Commodore 4000. Complete accounts production system.
	£2,052.75	Commodore 8000		Data-Lex	32K		●		●	●			D1	Designed for solicitors + others who need to separate office & client's accounts.
	£2,070	Commodore 8000	●	Microfacts	32K		●			●			M1	Also on Commodore 700, Victor & Sirius. £345 per module. Integrated accounting.
	£454.25	Commodore 8000	●	Micro-simplex	32K		●			●		●	M2	Also on Commodore 64 (£172.50). Needs printer. For smaller retail business.
	£2,300	Commodore 4000	●	Pegasus Integrated Accounting Suite	32K		●			●			P3	Also on MS-DOS (128K). Contains six stand alone modules.
	£116.00	CP/M	●	CalcStar 1.4	160K		●			●			M10	Also on IBM PC, MS-DOS. Integrates with WordStar and InfoStar.
	£1,437.50	CP/M		Aurora Integrated Accounting Package	64K		●		●	●			G1	Five stand alone modules. Sales, invoicing, purchase, nominal and stock.
	£2,760	CP/M		Boss	64K		●		●				F1	Seven stand alone modules. Can link to Autowriter & Autoindex.
	£805	CP/M	●	Cash Book Accounting	64K		●		●	●			S2	Also on CP/M-86 and MS-DOS. Amalgamation of sales, purchase & nominal ledger.
	£2,300.00	CP/M		dBFlex	48K		●		●	●			E1	Open item six module accounting system, (£575.00) per module. Works with dBase II.
	£402.50	CP/M	●	Exact	64K		●		●	●			S3	Also on MS-DOS. Includes six modules — invoicing, ledgers, stock and payroll.
	£1,840	CP/M	●	ISBS-S	48K		●		●	●			G2	Also on CP/M-86. Contains seven modules.
	£2,271.25	CP/M	●	Multi-Index	64K		●		●	●			B1	Also on MP/M & PC-DOS. Contains five modules. Sales, nominal, VAT & stock control
	£569.25	CP/M	●	Nucleus	64K		●		●	●			C2	Also on MS-DOS. Disk drives of 280K needed. A program generating system.
	£1,431.75	CP/M		Padmede Business Control System	64K		●		●	●			P2	Five modules (£286.35 per module). Nominal, sales, purchase, invoicing, stock.
	£1,380	CP/M	●	Motor Dealers Part Distribution	64K		●		●	●			S2	Also on CP/M 86 & MS-DOS. Combines stock control, order processing ledgers.
	£1,868.75	CP/M	●	Peachtree Basic Accounting Systems	48K		●		●	●			P1	Also on MP/M & MZ-DOS. Available on hard disk (£2,156.25). 5 stand alone modules.
	£287.50	CP/M	●	Sales Ledger	64K		●		●	●			S2	Also on CP/M 86 and MS-DOS. Flexible ledger system.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied			Mail order avail.	Hardware Required			Publisher/ Distributor	Comments
						Cassette	Disk	Cartridge		Disk drive	Joystick	Other		
	£45.42	Sharp MZ80A	●	Easy VAT	48K	●			●	●			K1	Also on Sharp MZ80B & M200K. VAT record system.
Agriculture	£1,150	Apple II		Dairy Package	64K		●			●			F2	Available on floppy or hard disk. Files individual cow production, with herd summaries.
	£1,725	Apple II		Financial Management Program	64K		●			●			F2	Available on floppy or hard disk. Accounts for farm/estate management.
	£1,150	Apple II		Management Program	64K		●			●			F2	Available on floppy or hard disk. Monitors individual field activities, budgets, etc.
	£35	Newbrain		Agricultural Field costings	32K	●			●				P8	Field data costings
Bill of Materials	£373.75	CP/M	●	Fastbill	60K		●		●	●			T2	Also on MS-DOS & TRS-DOS. Will give parts explosion at 10 levels, 99 items/level.
Bookeeper	£56.35	Apple II		Apple Bookeeper	48K		●		●	●		●	H1	Needs printer. Keeps petty cash, sales, other business books, sorts, analysis etc.
Building Specifications	£460	Commodore 8000	●	National Building Specifications	32K		●		●	●			C3	Also on Commodore 4000. Used with Wordcraft. Produces building specifications.
Business Graphics	£471.50	16-bit machines		Micro-Graphpower	128		●		●	●		●	I2	Needs plotter. Business graphics which plots business data.
	£120.75	Apple III	●	Business Graphics	48K		●			●			P6	Also on Apple II (£125.35). Supports range of plotters & pie-charts, etc.
	£149.50	IBM PC	●	Graph Magic	96K		●		●	●			F1	Also on Apple II, III. Displays files graphically. Reviewed 18.3.83.
Business Management	£569.25	Commodore 8000		The Administrator	96K		●		●	●			S11	Complete applications generator. No programming required.
	£4,140	CP/M		Peachtree Business Management System	48K		●		●	●			P1	Also on MP/M & Unix. Available on hard disk (£6,900). Six modules for single user.
	£684.25	IBM PC	●	Tomorrow's Office	128K		●		●	●			S11	Also on Sirius, Victor & MSDOS. Complete applications generator.
Cash Book	£224.25	Commodore 4000	●	Electronic Cash Book	32K		●		●	●			D1	Also on Commodore 8000 & 64. For small business or add-on products.
Cataloguing	£46.00	Apple II		Floppy Cat	48K		●		●	●			P4	Enables user to catalogue & store all information.
	£35.00	Newbrain		Dentists' NHS Schedule	32K	●				●			P8	Aid for checking statutory returns.
Estate Agents	£1,092.50	Apple II		Commercial Agency Systems	48K		●		●	●			C7	Matches in both directions with lists, labels and letters.
	£977.50	Apple II	●	Cyderpress Clients Recoverable Costs	48K		●		●	●			C7	Also on Rair Black Box. Designed to keep record of incurred expenditures.
	£1,121.00	Apple II	●	Cyderpress Residential System	48K		●		●	●			C7	Also on Rair Black Box. An applicant & property matching system.
	£419.75	CP/M		Estate Agents Match & Mail	56K		●		●	●			S4	Matches & prints out potential customers for every property.
Financial Accounting	£569.25	Commodore 8000	●	Finplan	32K		●			●			M3	Also on Commodore 3, 4, & 8000, Vic-20 and Commodore 64. £46.57 on floppy disk.
	£287.50	Commodore 8096		The Financial Director	96K		●			●			D1	Designed to handle large & complex planning & financial applications.
Financial Planning	£44.85	Commodore Pet		Busicalc	16K	●			●				S5	Also on Hytec & ICL PC. 96K version available. Helps decide on financial strategy.
	£188.60	Apple II	●	VisiCalc	48K		●		●	●		●	R1	Also on Apple III, Commodore & IBM PC, etc. The classic spreadsheet.
	£345.00	CP/M		Bottom-Line Strategist	48K		●		●	●			P4	A business/project forecasting program. Allows user to test business assumptions.
	£454.25	CP/M		Fastplan	64K		●		●	●			C5	Needs double density disks. A file based modelling system for business planners.
	£281.75	CP/M	●	Master Planner	64K		●		●	●			C5	Also on MS-DOS & CP/M 86. Needs 80 column printer. Upgrade of a spreadsheet.
	£396.75	CP/M	●	Micro Plan	64K		●		●	●			B1	Also on MP/M. Spreadsheet financial planner.
	£343.85	CP/M		Minimodel Financial Modelling	48K		●		●	●		●	G1	Needs 80 column screen. Model consolidation facility, colour option.
	£182.85	CP/M	●	Multi-Plan	48K		●		●	●			P4	Also on PC-DOS, Cromix, Fortune, Corvus & Sirius. Second generation spreadsheet.
	£44.85	CP/M		Plannercalc	64K		●		●	●		●	C5	Needs 80 column screen. Entry level system for spreadsheet planning.
	£218.50	CP/M		SP2020	48K		●		●	●			G2	Forecast effects of proposed actions. Aid to management decision-making.
	£172.50	CP/M		Supercalc	128K		●			●			A1	Electronic worksheet, representing a large flexible accounting work pad.
	£212.75	CP/M		Super Calculator	48K		●		●	●			E1	Spreadsheet calculator.
	£178.25	CP/M		T-Maker	48K		●		●	●			L1	Utility for analysis & presentation of numerical data & test material.
	£224.25	MS-DOS		Pulsar Business System	128K		●			●			A1	Consists of eight integrated packages & provides commercial accounting functions.
	£339.25	Osborne	●	PADA/C	64K		●		●	●			P2	Also on CP/M. Two systems. Incomplete records accounting, time/cost recording.
	£632.50	UCSD-P System		Microfinesse	128K		●		●	●			P5	Financial modelling program for businessmen.
	£741.75	UCSD-P System	●	Micro-Modeller	48K		●			●		●	I2	Also on CP/M & MS-DOS. Designed for large corporations.
Industrial Costing	£747.50	Apple II	●	Stock & Production Costing	48K		●		●	●		●	A2	Also on Apple IIE & III & Sirius. Available on hard disk. Needs Pascal system.
Insurance Accounting	£1,380	Commodore 4000	●	Insurance Man	32K		●			●			C4	Also in Commodore 8000, provides insurance broker with sales ledger.
Insurance Broking	£5,462.50	ICL DRS20		HS-100	64K		●		●	●		●	H2	Requires 16 or 27 Mb hard disk to run off. Maintains client & policy records.
Integrated Software	£569.25	IBM PC		Context MBA	256K		●			●			B2	Also on Sirius & Victor. Comprises word processor database management system.
	£908.50	Commodore 8000	●	Silicon Office	256K		●			●			F1	Integrated spreadsheet modelling, graphics, WP, database & communications.
Linear Programming	£373.75	CP/M	●	Optimiser	48K		●		●	●			C6	Also on Apple. Management tool for optimizing the deployment of scarce resources.
Local Authority	£862.50	Commodore 8000	●	P.U.S.W.A.	96K		●			●			M3	Also on Hytec. Monitors road holes under Public Utilities Street Work Act (1950).
Mailing	£86.25	CP/M		Mailing List	56K		●		●	●			S4	Works with Super file. Prints labels, files, names & addresses. Mail merge facility.
	£149.00	CP/M	●	Mail Merge	56K		●			●			M10	Also on IBM PC, MS-DOS. Integrates with WordStar.

Management	£226.16	CP/M	●	Scratch Pad 3.0	48K		●		●	●			M4	Also on CP/M 86, MS-DOS & PC-DOS. Spreadsheet using virtual memory.
Mathematics	£28.75	Commodore Pet	●	Infinite Arithmetic	16K	●			●				S5	Also on Commodore 3000, 4000 & 8000. Available on floppy disk.
Medical	£517.50	Apple II	●	Medical System	48K		●		●	●			A2	Also on Apple IIE, III & Sirius (£573.85). On hard disk. Age/sex register.
Office Information	£402.50	Apple II	●	Prophet II	48K		●		●	●			A4	Also on IBM PC & Corvus Concept. Information system which acts as a noticeboard.
Payroll	£69.00	Apple II		Payroll	48K		●			●		●	H1	Also available as cassette for Spectrum ZX81 (£25.00). Needs printer.
	£287.50	Apple II	●	Tabs Payroll	48K		●		●	●			T3	Also on CP/M & MS-DOS (64K). Up to 2000 employees, nine pay schemes.
	£977.50	CP/M	●	Powerday	48K		●			●			O2	Also on MP/M and MS-DOS. Integrates with Omicrons nominal ledger. Handles SSP.
Production Control	£2,645	CP/M, MP/M		Modular Production System	48K		●			●			B4	Stock control, bill of materials, etc, flexible reporting, audit trails, etc.
Project Management	£747.00	IBM PC	●	Micronet	48K		●			●			T2	Also on ICL PC, Sirius, Superbrain, Apple II, & others. Critical path analysis.
Project Planning	£1,150.00	Commodore 8000		Hornet	32K		●			●			C3	Has eight optional variants (all eight £4,025). Network logic & variety of screen display.
Property Management	£517.50	Apple II	●	Property Management System	48K		●			●			A2	Also on Apple III, Apple IIe & Sirius. Prints rent reminders, demands etc.
Purchase Ledger	£287.50	Apple II	●	Tabs Purchase Ledger	48K		●		●	●			T3	Also on CP/M & MS-DOS (64K). Open item ledger — automatic payment facility, etc.
	£805.00	CP/M	●	Powerbought	48K		●			●			O2	Also on MP/M & MS-DOS. Integrates with Omicron's Nominal Ledger System.
Sales Ledger	£287.50	Apple II	●	Tabs Sales Ledger	48K		●		●	●			T3	Also on CP/M & MS-DOS. Part of integrated system. 300 analysis codes.
	£805.00	CP/M	●	Powersales	48K		●			●			O2	Also on MP/M & MS-DOS. Multi-user system based on mainframe software.
	£325	DEC Rainbow 100	●	Sales Ledger System	64K		●		●	●			D2	Also on DEC Mate II. Invoicing & monthly statement generating system.
Sales Order Processing	£805.00	CP/M	●	Compact Sales Order Processing	64K		●		●	●			C2	Also on CP/M 80, 86 & MS-DOS. Comes on hard disk. Control, stock, ledgers.
Sales, Purchase, Nominal Ledger	£1,207.50	CP/M	●	Compact Sales, Purchase & Nominal Ledger	64K		●		●	●			C2	Also on CP/M 80, 86 & MS-DOS. Follows standard accounting procedures.
Sick Pay	£80.50	Apple II	●	Statutory Sick Pay (SSP)	48K		●		●	●			H1	Also on Spectrum. Does all SSP calculations.
Statistics	£172.50	Apple II	●	Inter-Stat	48K		●		●	●		●	G1	Also on Basis 108 & ITT 3030. Needs printer.
	£287.50	Commodore Pet	●	Statistical Package for PCs	32K		●		●	●			P7	Also on Commodore 64 (two modules at £99 each) & Sirius. Fully interactive.
	£9.20	Sharp MZ80A	●	Statistical Analysis	48K	●			●				K3	Also on MZ80K. Calculates mean & standard deviation for up to 100 items.
	£15.00	Sinclair ZX81	●	Critical Path Analysis (CPA)	8K	●			●				H1	Also on Spectrum (16K). Activities entered from arrow diagram. Finds critical path.
	£977.50	UCSD-P System		Trend Plot	128K		●		●	●		●	P5	Needs Hewlett Packard plotter. Developed to analyse historical time series data.
Stock Control	£3,289	CP/M		M-SIS	48K		●			●			T2	Stock control system for manufacturing industry.
	£33.92	Newbrain		Stock Control 40/4	32K	●			●				E2	Stores large quantities of stock, accumulates new stock levels & checks stock level.
	£25.00	Sinclair Spectrum	●	Stock Control	48K	●			●				H1	Also ZX81. Fast fwd/add/delete item. Prints complete or selective lists & total value.
	£12.50	Sinclair Spectrum		Stock Controller	48K	●			●				D5	Can be used with or without ZX printer.
Word Processing	£92.00	Apple II		Piewriter	48K		●		●	●		●	M5	Needs 80 column card. Allows entry, editing & print formatting of any text type.
	£125.35	Apple II		Wordhandler	48K		●		●	●			P4	Word processor for the non-professional — minimum Apple system.
	£152.95	Apple III	●	Apple Writer 2	48K		●			●			P6	Also Apple II. Has word wrap, glossary & word processing language.
	£28.50	BBC Model B		Alphabeta	32K	●			●				H3	Also available on disk. Suitable for home & business.
	£10.50	BBC Model B		Word Pro	32K	●			●				I4	Includes DELETE, INSERT, SAVE, Date etc.
	£90.85	Commodore 64		Infomast	64K		●		●	●			R2	Combined programmable word processor, Database and calculator.
	£89.00	Commodore 64	●	Paperclip	64K		●		●	●			K5	Also Commodore 8000. Compatible with WordPro & SpellPro.
	£488.75	Commodore 8000	●	Wordcraft	32K		●			●			D1	Also on SuperPet, Sirius 1, IBM PC & CBM 64. Routine correspondence, mailing, etc.
	£51.75	Commodore Pet	●	Papermate +	16K	●			●				S5	Also on Commodore 64, 3, 4, & 8000. Available on floppy (£53.49).
	£145.00	CP/M	●	Mail Merge	64K		●			●			X1	Also on CP/M 86 and PC-DOS. An optional MERGE, PRINT, extra for Wordstar.
	£295.00	CP/M	●	WordStar 3.3	56K		●			●			M10	Also on IBM PC, MS-DOS. Integrates with CalcStar, InfoStar, Mail Merge, SpellStar.
	£287.50	CP/M	●	Peachtext	48K		●			●		●	P1	Also MP/M & MS-DOS. Needs high quality printer. Contains proof reader.
	£339.00	CP/M	●	Perfect Writer/Speller	64K		●		●	●			S3	Also MS-DOS & Apple DOS. Contains quick reference card.
	£431.25	CP/M	●	Select Word Processing System	64K		●		●	●			B1	Also MP/M & PC/DOS. Screen-oriented system.
	£316.25	CP/M	●	Spellbinder	48K		●		●	●			E1	Also on Oasis. Word processing & office management system.
	£333.50	CP/M		WP2020	48K		●		●	●			G2	Menu-driven, machine independent. Set of key-tops provided.
	£225.00	IBM PC		Easywriter II	64K		●			●			X1	Bold face & underscoring on screen. 80,000 word spell checker extra (£43.15).
	£340.40	IBM PC		VisiWord	64K		●			●		●	R6	Mail merge facility with Visi file.
	£339.25	MS-DOS	●	WordStar	128K		●			●		●	A1	Also on CP/M. Needs printer. Complete screen-based WP.
	£40.25	Newbrain		Word Processor 40/12	32K	●			●				E2	Automatic word wrap, editing, saving paragraphs, deleting.
	£325.00	OS9		Stylograph	32K		●			●			S6	Expandable system with modular design.
	£45.42	Sharp MZ804	●	Wordpro	48K	●			●				K1	Also on MZ80B+K. Available on disk (£91.94). One of few WP packages for Sharp.
	£49.95	Tandy TRS 80 I	●	AJ Edit	32K		●		●	●		●	M6	Also on Genie I & II. Needs printer.

EDUCATION

Basic Course	£9.95	Texas Instruments 99/4A		Beginners Basic Tutor	16K	●			●				T5	Gives explanations and examples of TI Basic — lets the user try.
	£13.95	Texas Instruments 99/4A		Teach Yourself Extended Basic	16K	●			●				T5	Needs extended Basic module.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied: Cassette	Media Supplied: Disk	Media Supplied: Cartridge	Mail order avail.	Hardware Required: Disk drive	Hardware Required: Joystick	Hardware Required: Other	Publisher/ Distributor	Comments
Business Game	£9.95	BBC Model A	●	Business Game	16K	●			●				W1	Also on Model B. Two games for economics, business & general studies, teaching.
	£5.95	BBC Model B	●	Inkosi	32K	●			●				C9	Also on Vic-20. Rule for ten years, overcoming obstacles, e.g. famines.
Chemistry	£14.38	Research Machine 380Z	●	Symbols To Moles	31K		●		●	●			H4	Also on Apple II. Practise using chemical symbols, writing & mole concept.
Children	£37.89	Apple II		Bumble Plot	48K		●		●	●			P4	A set of five programs for developing graphics and maths skills. For children 8 to 13.
	£29.84	Apple II	●	Face Hanger	48K		●		●	●			P4	Also on IBM PC. Designed for children to learn computer keyboard by building up face.
	£37.89	Apple II		Gertrude's Secret	48K		●		●	●			P4	An educational game to teach logical thinking & planning. For children aged 6-9.
	£9.80	Atari 400	●	Jigsaw Puzzles	16K	●							T4	Also on Atari 800. Has 16 puzzles and optional difficulty.
	£9.95	BBC Model B		Letters	32K	●			●				C9	Designed for children aged 4-6 & for dyslexic & remedial children.
	£9.95	BBC Model B	●	Metrics	32K	●			●				C9	Also on Vic-20+ Spectrum. Structure of metric system, for children aged 10-15.
	£5.95	BBC Model B	●	Pascal	32K	●			●				C9	Also on Vic-20. Shows construction of Pascal Triangle and tests on it.
	£5.95	BBC Model B	●	Sequences	32K	●			●				C9	Also on Vic-20. Demonstrates number patterns.
	£6.50	BBC Model B		The Early Stages	32K	●			●				H3	Reading aid. Plays nursery rhymes. Available on disk.
	£4.50	BBC Model B		Super Hangman	32K	●			●				I4	Version of famous game. High resolution graphics. 800 words or enter own choice.
	£9.95	BBC Model B		Tree of Knowledge	32K	●			●				A9	Interactive program teaching categorisation. Simplified information retrieval.
	£4.95	Sharp MZ80A	●	Giant Maths	32K	●			●				S8	Also on MZ80K. Big screen figures & humorous error messages. 5 to 11 years.
	£4.95	Sharp MZ80A	●	Rocket	3K	●			●				S8	Also on MZ80A. Four difficulty levels. For five to 11 year olds.
	£9.20	Sharp MZ80A	●	Teach Tables	48K	●			●				K3	Also on MZ80K. Plays like game but motivates children to improve their ability.
	£4.95	Sharp MZ80K	●	Master Builder	48K	●			●				S8	Also on MZ80A. Repair a wall using random blocks. Teaches spacing.
	£5.25	Spectrum		Alphabet	48K	●			●				W2	'Picture for each letter of the alphabet. Option for lower case.' Aimed at ages 2-6.
	£5.25	Spectrum		Adding and Subtracting	16K	●			●				W2	For children aged 3-7. Three animated programs with full graphics.
Classroom Monitor	£322.00	UCSD-P	●	Classroom Monitor	64K		●		●	●			K4	Also on Apple II. Provides demonstration facilities & monitors student's progress.
Economics	£28.75	Sharp MZ80K	●	Broadwater Economics Simulation	16K	●			●				W1	Also on Commodore Pet & BBC. Simulates micro & macro economics.
French	£14.38	Research Machine 380Z	●	Repondez	31K		●		●	●			H4	Also on Apple II. Practising French verb formation (present tense).
	£9.20	Sharp MZ80A	●	French Conjugate	48K	●			●				K1	Also on MZ80K. Automatically conjugates regular verbs into tenses.
	£9.20	Sharp MZ80A	●	French Verbs	48K	●			●				K1	Also on MZ80K. Allows user to impart up to 20 verbs & eight tenses at a time.
Graphics	£8.00	BBC Model B	●	Painter	32K	●			●				A5	Also on Spectrum (£5.75), Atom (£6.90) & on disk.
	£9.95	BBC Model B		Creative Graphics	16K	●			●				A9	Book available (£7.50). Designed to illustrate BBC graphics.
History	£20.13	Sharp MZ80A	●	Kings & Queens	48K	●			●				K1	Also on MZ80K. Facts & figures on English monarchs since 1066.
Languages	£7.95	Sharp MZ80A	●	Multilinguist	3K	●			●				S8	Also on MZ80K. A language tutor to suit all European languages.
Mathematics	£8.95	BBC Model B		Angle	32K	●			●				C9	Also on Spectrum. Includes four programes designed to teach simple geometry.
	£9.95	BBC Model A	●	Algerbraic Manipulations	16K	●			●				W1	Also on Model B. Includes four programs designed for use in maths teaching.
	£82.80	IBM PC		Fact Track	64K		●			●			I3	Learning basic arithmetic. Presents simple two-line sums in random order.
	£46.00	Sharp MZ80A	●	Curve Fitting	48K	●			●				K3	Also on MZ80K. Calculates, intercepts & plots power curve.
	£9.20	Sharp MZ80A		Directed Numbers	48K	●			●				K3	Also on MZ80K. Teaches difficult mathematical functions.
	£9.20	Sharp MZ80A	●	Divisor Advisor	48K	●			●				K3	Also on MZ80K. Teaches division at a variety of skill levels.
	£27.60	Sharp MZ80A	●	Numerical Integration	48K	●			●				K3	Also on MZ80K & B. Teaches Simpson's Rule.
	£5.25	Spectrum		Counting	16K	●			●				W2	Graded programs. 'Good as a first introduction to numbers.' Aimed at ages 3-6.
Meteorology	£23.00	Research Machines 380Z	●	Weather	31K		●		●	●			H4	Also on Apple II. Gives synoptic charts. Teaches elementary meteorology.
Morse Code	£9.20	Sharp MZ80A	●	Morse Tutor	48K	●			●				K3	Also on MZ80K. Used to teach morse code by sight and sound. At seven levels.
Physics	£14.38	Research Machines 380Z	●	Lenses	31K		●		●	●			H4	Also on Apple II. Illustrates formation of images by lenses using ray diagrams.
	£9.20	Sharp MZ80A	●	Casino Chips	48K	●			●				K3	Also on MZ80K. Uses radioactive chips to teach half-life concept.
Typing	£28.75	CP/M	●	Touch'n'Go	48K		●		●	●			C6	Also on MS-DOS. Typing tutor for mastering numeric pad & Qwerty keyboard.
	£31.05	IBM PC		Typing Tutor	64K		●			●			I3	Presents exercises for learning touch typing or for improving existing skills.

GAMES

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied: Cassette	Media Supplied: Disk	Media Supplied: Cartridge	Mail order avail.	Hardware Required: Disk drive	Hardware Required: Joystick	Hardware Required: Other	Publisher/ Distributor	Comments
Adventure	£17.95	Atari	●	Arrow of Death	16K	●			●				C8	Also runs on TRS-80, BBC, Vic-20. A 'classic text adventure'.
	£7.99	BBC Model B	●	Adventure	16K	●			●				M7	Also runs on Atom. 'Many rooms to explore and many hazards to overcome'.
	£9.95	BBC Model B		Philosopher's Quest	16K	●			●				W1	'Progress through a world of fiendish puzzles.'
	£9.95	BBC Model B		Sphinx	16K	●			●				W1	'A classic adventure, moving through caves avoiding hazards to collect treasure'.
	£13.80	Commodore Pet	●	Hitch-Hikers Guide to the Galaxy	32K	●			●				S5	Also runs on Commodore 64, Vic-20, 3000, 4000, 8000. 'Involved, textual game'.
	£18.40	Commodore Pet		Pythonesque	32K	●			●				S5	'Increasingly difficult textual game based on Monty Python'. Disk available (£20.12).
	£24.99	Commodore Vic-20		River Rescue	8K			●			●		T4	Needs joystick. 'Captain boat through treacherous rivers to rescue explorers'.

	£8.00	Dragon 32		Escape	32K	●			●		●		M12	Needs joystick. 'A 3D maze game. Get clues from 15 rooms for code of elevator'.
	£8.00	Dragon 32		Flipper	32K	●			●				M12	'A game of intrigue and strategy. Requires an agile mind and a lot of fore-thought'.
	£8.00	Dragon 32		Mansion Adventure	32K	●			●				M12	'Wind your way through an old mansion picking up clues to find the diamond',
	£7.95	Dragon 32		Wizard War	32K	●			●		●		S7	Needs joystick. 'Magical combat for two to nine players; interactive duel'.
	£35.00	IBM PC		Adventure in Serema	64K		●					●	I3	Needs colour graphics adaptor and direct drive colour monitor for use.
	£6.90	Oric	●	Zodiac	16K	●			●				A5	Also runs on Atom. 'A thinking persons adventure game'.
	£12.07	Sharp MZ80A	●	Adventure	48K	●			●				K1	Also runs on Sharp MZ80B and MZ80K. 'An interactive adventure game'.
	£12.07	Sharp MZ80A	●	Quest	48K	●			●				K1	Also runs on Sharp MZ80B and MZ80K. 'Dungeons & Dragons type game'.
	£7.95	Sharp MZ80K	●	Nightmare Park	48K	●			●				S8	Also runs on MZ80A. 'Cross Nightmare Park. Every few steps play game or task'.
	£7.95	Sharp MZ80K	●	Tombs of Karnak	48K	●			●				S8	Also runs on MZ80A. 'Bargain for items required before entering tombs'.
	£5.95	Spectrum		Faust Folly	16K	●			●				A6	'A 16K adventure with the same traps, magic, fiends, treasure as the 48K game'.
	£14.95	Spectrum		The Hobbit	48K	●			●				M8	'Object is to get treasure. For one player. Can instruct computer in ordinary English'.
	£5.00	Spectrum	●	Orb	16K	●			●				I5	Also runs on Dragon 32 and Commodore Vic-20. 'Explore labyrinth and destroy Orb'.
	£10.00	Spectrum	●	Pimania	48K	●			●				A7	Also runs on Sinclair ZX81, BBC 13, Dragon 32. Reviewed 18.3.83.
	£5.00	Spectrum	●	The Quest	48K	●			●				I5	Also runs on Dragon 32. 'Fighting adventure game'.
	£5.00	Spectrum	●	Star Trek	48K	●			●	●			I5	Also runs on Dragon 32 and Commodore Vic-20. 'Hunt down the Klingon in space'.
	£5.95	Spectrum		Slippery Sid	16K	●			●		●	●	S9	Needs joystic and keyboard to use. 'Snake type game'.
	£10.06	Tandy TRS-80 I	●	Mysterious Adventurer	16K	●			●				M6	Also runs on Tandy TRS-80 III, Genie I, II, Colour Genie and BBC B.
	£4.95	Texas Instruments 99/4A		Forbidden City	16K	●			●				A8	'You have to explore a deserted alien city with many hazards on the way'.
	£3.95	Texas Instruments 99/4A		Sorcerers' Castle	16K	●			●				A8	'You are trying to rescue the captured princess'.
	£7.50	BBC Model B		Atlantis	32K	●			●				I4	'Guide submarine through caverns & destroy enemy'.
Arcade type	£9.99	Commodore Vic-20		Night Crawler	5K	●			●				R2	'A Centipede style game. Fast action, graphics and sound effects'.
	£5.50	Spectrum	●	Arcadia	16K	●			●				I6	Also on Commodore Vic-20. '12 levels of aliens attacking in different ways'.
	£5.95	Spectrum		Ground Attack	16K	●			●				S9	'Variable speeds allows this game to be played by everyone'.
	£3.95	Texas Instruments 99/4A		Bomber	16K	●			●				A8	'Must land plane & bomb skyscrapers'.
	£5.95	Spectrum		Cyber Rats	16K	●			●		●	●	S9	Needs joystick and keyboard to run.
Asteroids type	£4.95	Spectrum		Meteor Storm	16K	●							Q1	'Progressive difficulty, variety of controls'.
	£6.95	Spectrum		Time-Gate	48K	●			●				Q1	'Time travel, 3D graphics, colour, cockpit view and instrument display'.
	£4.95	ZX81		Asteroids	4K	●			●				S9	'Fast moving, suitable for all ages'.
Ballooning	£14.95	Atari 400	●	Up Up Away	16K	●			●				S13	Reviewed in *PCN* week ending April 29. Also on Atari 800. Available on disk.
Centipede type	£7.99	Dragon 32		Caterpillar	32K	●			●		●		M12	'A new generation munching game'.
Chess type	£7.99	BBC Model B		Chess	16K	●			●				M7	'Machine code, high resolution graphics with many play options'.
	£24.95	Dragon 32		Cyrus Chess	32K			●					D3	'Won European microcomputer chess championship 1981. Nine levels of difficulty'.
	£14.50	Sharp MZ80A	●	Chess	48K		●	●					K1	Also on Sharp MZ80B & MZ80K. '14 levels of difficulty'.
	£42.95	Texas Instruments 99/4A		Chess	16K		●	●					T5	'Different difficulty levels. Will solve problems. Can teach chess'.
Darts	£19.99	Atari 400	●	Darts	8K	●					●		T4	Also on 800. 'Aim & throw — the computer does the arithmetic'.
Defender type	£22.80	Atari 400/800	●	Submarine Commander	16K			●		●			T4	'One player. Nine levels of difficulty. Destroy shipping. Oxygen levels, fuel etc'.
	£9.95	BBC Model B		Planetoid	32K	●			●				A9	'A game of speed & skill'. Available on floppy disk (£11.50).
	£7.95	Commodore Vic-20		Alien Blitz	5K	●			●		●		A3	Needs joystick to run. 'Difficulty levels, colour & sound'.
	£9.99	Commodore Vic-20		Annihilator	3K	●			●		●		R2	'Based on Defender'.
	£6.95	Spectrum		Penetrator	48K	●			●				M8	'Two levels of difficulty difficulty'.
	£21.95	TI 99/4A		Parsec	16K			●	●				T5	'Increasingly difficult. After four onslaughts pass through to next stage'.
Flight Simulator	£22.80	Atari 400	●	Jumbo Jet Pilot	16K	●					●		T4	Also Atari 800. 'Ten difficulty levels. View through cockpit with flight instrumentation'.
	£7.95	Spectrum	●	Flight Simulation	48K	●			●				S10	Also on ZX81 (£5.95). 'Shows control panel & control view'.
	£17.20	Tandy TRS-80	●	Jumbo	16K	●			●				M6	Also on Genie I, II & BBC Model B. 'Simulation of piloting a Jumbo'.
Football	£29.99	Atari 400	●	Kick Back	8K			●			●		T4	Also available on Atari 800. Needs joystick to run. 'Beat the high score'.
	£19.55	Atari 400	●	Soccer	8K			●					T4	Also on Atari 800. 'Aerial view of field.' Reviewed 11.3.83.
Frogger type	£5.50	Commodore Vic-20		Wacky Waiters	3.5K	●			●				I6	'Waiter serving drinks in hotel. Has to hop from lift to lift'.
	£9.99	Commodore Vic-20		Hopper	3K	●			●		●		R2	'A version of Frogger'.
	£5.95	Spectrum		Horace Goes Ski-ing	16K	●			●				S10	'Sequel to Hungry Horace. He must cross busy road, fetch skis & ski down slope'.
Golf	£7.95	Dragon 32		Golf	32K	●			●				S7	'For one or two players. Full handicapping system'.
	£3.75	Spectrum		Golf	16K	●			●		●		R3	'For one or two players. Choice of nine or 13 holes'.
	£3.75	Sinclair ZX81		Golf	16K	●			●		●		R3	'Similar to other golf games, in black and white'.
Helicopter	£24.95	Commodore Vic-20	●	Chop Lifter	8K			●	●		●		A3	Also on Commodore 64. Needs joystick to run. 'Vic version of USA's best-seller'.
Jigsaw	£14.99	Atari 400	●	British Heritage Jigsaw Puzzle	8K	●							T4	Also on Atari 800. 'Educational game with selective difficulty'.
Kong type	£7.95	Commodore Vic-20		Bonzo	8K	●			●		●		A3	'Workman dodges robots on split-level. Sound & full graphics.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied: Cassette	Media Supplied: Disk	Media Supplied: Cartridge	Mail order avail.	Hardware Required: Disk drive	Hardware Required: Joystick	Hardware Required: Other	Publisher/ Distributor	Comments
	£8.00	Dragon 32		Donkey King	32K	●			●		●		M12	'Popular arcade game'.
	£9.95	BBC Model B		Monsters	32K			●					W1	'The player has to run up & down ladders & along walls, pursued by monsters'.
Maze type	£24.95	Dragon 32		Ghost Attack	N/A			●			●		D3	'The aim is to avoid & eliminate ghosts which roam a maze'.
	£8.00	Dragon 32		Jerusalem Adventure	32K	●			●				M12	'Aim is to get treasure & avoid being eaten'.
	£5.95	Spectrum		Hungry Horace	16K	●			●				S10	'Animated maze game with sound & full graphics'.
	£4.95	Spectrum	●	Mined-Out	48K	●			●				Q1	Reviewed in *PCN* week ending April 22. Also on Dragon 32.
	£5.95	Spectrum		Muncher	16K	●					●		S9	'A monster munching marathon'.
	£8.00	Spectrum		Spectres	16K	●							B3	'An increasingly difficult maze game. The object is to fit light bulbs & destroy ghosts'.
	£10.00	Sinclair ZX81		Mazogs	16K	●							B3	'Three levels. Find & collect treasure in a maze & escape'.
Pacman Type	£9.95	BBC Model B		Snapper	16K	●			●		●		W1	'Based on Pacman'.
	£9.50	Colour Genie		Chomper	16K	●							K2	'Based on Pacman'.
	£8.00	Dragon 32		Scarfman	32K	●			●				M12	'Based on Pacman'.
	£4.95	Spectrum		Gnasher	16K	●			●				R3	Joystick optional. 'Based on Pacman using Beano characters'.
Pool	£8.50	BBC Model B		Billiards	32K	●			●				H3	Available on disk. 'A game for all ages'.
Racing	£7.95	Dragon 32		Grand Prix	32K	●			●		●		S7	'For one or two players, features eight Grand Prix tracks & 10 levels of difficulty'.
	£21.95	TI 99/4A		Car Wars	16K			●	●				T5	'Race through maze whilst avoiding computer controlled car'.
Science Fiction	£19.95	Apple II		Lunar Leeper	16K		●			●			S12	Reviewed in *PCN* week ending April 22.
Shooting	£29.95	Atari 400	●	Claim Jumper	16K			●	●		●		C8	Also on Atari 800. 'A two player shoot-out over gold nuggets & cash'.
	£29.95	Atari 400		Shamus	16K			●	●		●		C8	'Player has to move through lair avoiding hazards'.
	£5.95	BBC Model B	●	Invisible Man	32K	●			●				C9	Also on Commodore Vic-20. 'Aim is to shoot man who keeps disappearing'.
	£9.99	Commodore Vic-20		Quacker	3K	●			●		●		R2	'Aim is to shoot down ducks & rabbits on shooting gallery'.
	£19.95	Commodore Vic-20	●	Spiders of Mars	N/A			●	●				A3	'Popular game for the Vic-20'. Also on Commodore 64.
	£5.95	Spectrum		High Noon	16K	●			●		●		A6	'Clean up chaos & disorder in town'.
Space	£9.95	Dragon 32		Dragon Trek	32K	●			●		●		S7	'A version of Star Trek with ten levels of difficulty'.
	£5.95	Spectrum		Android Run	16K	●			●		●		A6	'Control android to shoot walls, kill mutants & reach central complex'.
	£5.95	Spectrum		Cosmos	16K	●			●		●		A6	'Defend space convoy from aliens & asteroids'.
	£5.50	Spectrum		Schizoids	16K	●			●				I6	'Space bull-dozer nudges shapes into black hole'.
	£5.95	Spectrum		Starship Enterprise	48K	●			●				S9	'Based on the classic Star Trek. Includes arcade action'.
	£4.95	Spectrum	●	Star Trek	48K	●			●				R3	Also on ZX81 (£3.95). 'One player, sound & full colour graphics strategy game'.
Space Invader type	£7.99	BBC Model B		Swoop	32K	●			●				M7	'Written in machine code with full colour & high resolution graphics'.
	£7.50	BBC Model B		Model B Invaders	32K	●			●				I4	'A Space Invaders game with high resolution & colour graphics'.
	£9.99	Commodore Vic-20		Orbis	3K	●			●		●		R2	'Based on Missile Command. Fast & colour'.
	£19.95	Dragon 32		Cosmic Invaders	N/A			●					D3	Joystick optional. '15 levels of difficulty'.
	£6.50	Spectrum		Destroyer	16K	●			●				I5	'Destroy the varying alien invaders'.
	£4.95	Spectrum		Intruders	16K	●			●				Q1	'Includes mutants, random saucers, bonus base & 14 different aliens. Sound & colour'.
	£5.00	Spectrum		Spectral Invaders	16K	●							B3	'For one or two players. Increasingly difficult, high resolution colour graphics'.
	£21.95	TI 99/4A		Invaders	16K			●	●				T5	'Based on Space Invaders. After every two screens a new character appears'.
	£3.95	Sinclair ZX81		Invaders	4K	●			●				S9	'Based on Space Invaders'.
Sport	£33.35	IBM PC		Decathlon	64K		●			●		●	I3	Needs colour graphics adaptor & direct drive colour monitor. 'For up to six players'.
Strategy	£7.95	Dragon 32		Wizard War	32K	●			●				S7	Reviewed in *PCN* week ending April 8.
Variety	£5.95	Commodore Vic-20		Innovation Cassette	48K	●			●				M8	'One tape containing seven games'.
	£5.95	Spectrum		Over the Spectrum	16K	●			●				M8	'One tape with 10 games. Defender to geometry, beginners to advanced'.
Various	£29.95	Atari 400	●	Picnic Paranoia	16K			●	●		●		C8	Also on Atari 800. Needs joystick to run. 'A graphics game based on picnic site'.
	£4.95	Colour Genie		Breakout	16K	●			●		●		M9	'Different levels of skill'.
	£6.95	Commodore Vic-20		Amok	5K	●			●				A3	'Chased by robots in enclosed room. Different levels of difficulty'.
	£9.95	Commodore Vic-20		Black Squid	3K	●			●		●		C8	'Get men to shore in shortest time'.
	£24.95	Commodore Vic-20		Mutant Herd	8K			●			●		T4	'Protect a powerhouse from mutants. Enter their burrows & destroy eggs'.
	£6.90	Dragon 32		Dead Wood	32K	●			●				A5	'A game for all the family'.
	£3.95	Texas Instruments 99/4A		Chalice of Kalmar	16K	●			●				A8	'The aim is to retrieve a chalice from a temple'.

HOME

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Cassette	Disk	Cartridge	Mail order avail.	Disk drive	Joystick	Other	Publisher/ Distributor	Comments
Clubs and Sports	£78.00	Sharp MZ80A		Clubman	48K	●			●				S8	Golf handicapping and competition results system complying with 1983 regulations.

	£575.00	Apple II	●	Tabs Golf Package	48K		●		●	●			T3	Alsom on MS/DOS (64K). Maintains members handicaps including 1983 regulations.
	£28.18	Epson HX20	●	Horse Race Forecast	48K	●			●				K1	Also on Newbrain and Sharp. A punters aid to betting.
	£28.69	Sharp MZ80A	●	Navex	48K	●			●				K1	Also on MZ80K. Simulations of navigating a yacht on the English Channel.
Diary	£9.95	BBC Model A	●	Desk Diary	16K	●			●				W1	Also on BBC Model B. Consists of address book & diary planner (plus instructions).
Home budget	£19.99	Atari 400	●	Home Financial Management	8K	●						●	T4	Also on Atari 800. Needs Atari Basic cartridge. Aids money management.
	£19.95	Epson HX20	●	Home Budget	16K	●			●				K1	Also on Sharp, MZ80 & Osborne. Keeps records of home finances with graphics.
	£14.95	Sharp MZ80A	●	Sam Analysis	3K	●			●				S8	Designed for balancing home debits & credits.
Music composition	£24.99	Commodore Vic-20		Vic Music Composer	8K			●					T4	Aids to aspiring composer. Also for entertainment and education.
	£5.75	Spectrum		Music Maker	48K	●			●				B5	Teaches musical notation, aids composition.
Stock control	£10.00	Spectrum		Spec File	48K	●			●				A5	Stock control program useful in home, e.g. record collection, etc.
Various	£4.95	Spectrum		ZX Text	16K	●			●				S14	900-page colour teletext simulation with 24-hour clock etc.
	£12.95	Commodore Vic-20		Home Office	5K	●			●				A3	Comprises VicPro (word processor) & VicData (A database program).

UTILITIES

Basic	£201.25	CP/M		Basic 80	48K		●		●	●			L1	Industry standard Basic.
	£235.70	CP/M		Basic Compiler	48K		●		●	●			L1	Companion to Basic 80. Allows programs to run faster.
	£80.50	CP/M		BDS C Compiler	48K		●		●	●			L1	A subset of 'C' that enables its implementation. Includes symbolic debuggers.
	£121.90	CP/M	●	C Basic	64K		●			●			X1	Commercial Basic. Also on CP/M86 (£265.65).
	£213	Any Z80		X-Basic	48K		●			●			X1	Built-in matrix functions. Supports MP/M record locking. Graphics option.
Basic Upgrader	74.75	Commodore 64	●	VicTree	64K	●			●				S5	Also Commodore Vic-20. Also on floppy (£92.00). Adds 50 commands to Basic.
Card Index System	£215.05	Apple II	●	VisiDex	48K		●			●		●	R1	Also on IBM PC. Needs printer. One record/screen designed for cross-referencing.
	£178.25	CP/M	●	Cardbox	48K		●		●	●		●	C6	Also on MS-DOS. Needs 24×80 VDU & 100K disk storage.
Communications	£102.35	Apple II		ASCII Express — The Professional	48K		●		●	●		●	P4	Needs RS232. Asynchronous serial communications package.
	£448.50	Apple II		Editel	48K		●		●	●		●	O1	Needs modem. A Viewdata frame word processor designed to aid data editing.
	£626.75	Apple II		Owlsync 3780	48K		●		●	●			O1	A full IBM 3780 emulator package allowing communication up to 2400 Baud.
	£454.25	Apple II		Owltel	48K		●		●	●		●	O1	Needs modem. Allows access to Prestel & private viewdata systems.
	£149.50	Apple II	●	Terminal Utilities	48K		●		●	●			C1	Also on Apple IIE. Converts Apple II to intelligent terminal. Speeds of up to 9600 BPS.
	£57.50	CP/M		Xcopy 1.0	64K		●		●	●			X1	Disk copy utility for Cromemco machines. Copies 8" or 5¼" single/double sided.
	£454.25	CP/M	●	Micro-Linkline	64K		●		●	●			I2	Also on UCSD-P. Teletype comms for transferring datafiles.
	£575	CP/M	●	Bisync AC-3780	64K		●		●	●			E1	Also on MP/M & CP/M86. Micro to mainframe comms through IBM terminal emulation.
	£41.40	IBM PC		Asynchronous Communications	64K		●			●		●	I3	Needs asynchronous comms adaptor. Makes PC act as asyncs comms terminal.
	£117.30	IBM PC		IBM 3101 Emulation Program	64K		●			●			I3	Makes PC act as 3101 terminal provides 3270 emulations when connected to host.
	£638.25	IBM PC		PC SNA 3270 Emulation	128K		●			●		●	I3	Needs SDLL adaptor card makes PC act as IBM 3270 terminal.
	£22.43	Sharp MZ80A	●	Zen	48K	●			●				K1	Also MZ80K & B. Full Z80 editor/assembler.
	£115.00	IBM PC	●	Interlink	48K		●			●			T2	Also on Sirius, Apple II, Xerox, Osborne etc. Connects processors for downloading.
Database	£132.25	Apple II		DB Master	48K		●		●	●			M5	Available on hard disk. Allows 1K records over 100 fields. Report generation, etc.
	£224.25	Apple II		Informex Database System	48K		●		●	●			I1	Database system which can be used to & update info on any type of record.
	£402.50	Apple II	●	Mailist	48K		●		●	●		●	A4	Also for IBM PC & Corvus Concept. Requires hard disk. A networking product.
	£96.60	Apple III	●	PFS: File	48K		●			●			P6	Also for Apple II (£135.70). Used in tandem with PFS (£96.60).
	£217.35	Apple IIE		VisiTrend + VisiPlot	64K		●		●	●			R6	Also for CP/M. Graphic representation of data. Compatible with VisiCalc.
	£10.30	BBC Model B		Filer	16K	●			●				M7	Allows searching, sorting, saving & recovery of data.
	£201.25	CP/M	●	Dataflow II	56K		●		●	●			G1	Also on CP/M 86. Needs 160K disk space. Extract files to link with other systems.
	£295.00	CP/M	●	InfoStar	48K		●			●			M10	Also on IBM PC, MS-DOS. Integrates with WordStar and Calcstar.
	£201.25	CP/M		Datastaff	64K		●			●			X1	Data entry & retrieval system. Interfaces with WordStar
	£499.74	CP/M		dBase II	48K		●		●	●			E1	Micro DBMS. Can be used for high level programming for a range of applications.
	£557.50	CP/M		Superfile	56K		●		●	●			S4	Multi-file database giving application package information.
	£166.75	CP/M		Supersort I16	64K		●		●	●			M10	A sort utility for handling various forms of data files. Mainframe-like additions.
	£1,840	CP/M	●	MDBS II	64K		●						T2	Also on CP/M-86, MS-DOS, Turbo DOS, Unix and Xenix. Mainframe-like facilities.
	£569.25	Commodore 8000		The Administrator	32K		●		●	●			S11	Applications generator. No programming involved.
	£68.42	Newbrain		Invoice & Credit Program	32K	●			●				E2	The invoice program allows you to put in your own information and design invoice.
	£29.32	Newbrain		Database 40/S	32K	●			●				E2	Information gatherer, stores large quantity of information & can be interrogated at will.
	£684.25	Sirius, IBM PC, MS DOS	●	Tomorrow's Office	128K		●		●	●			S11	Complete applications generator.
Debugger	£258.75	CP/M	●	Animator	64K		●		●	●			M11	Also on Unix & MS100S, interactive source level debugging tool for CIS-Cobol.
File Transfer	£132.25	CP/M		BSTAM	16K		●		●	●		●	L1	Needs common interface ports or modem access. Utility for transfering CP/M files.
Graphics	£34.50	Apple II	●	Graphic Utilities	48K		●		●	●			C1	Also for Apple IIe. Parameter driven machine code programs' high res graphics.
	£24.95	Atari		Constructor	48K		●		●	●	●		C8	Less experienced & new programmers can design animated sequences.
	£9.95	BBC Model A	●	Creative Graphics	16K	●			●				W1	Also for BBC model B.30 programs on cassette produce range of pictures & patterns.

	£24.95	BBC Model B		EDG Graphics Package	32K	●			●				S7	Computer aided design package. Reviewed 11.3.83.
	£50.60	CP/M		CP/M Graphics	64K		●			●			D4	Range goes up to £421.70 & conforms to GKS Graphics Standard.
Language	£488.75	CP/M	●	CIS Cobol	64K		●		●	●			M11	Also on Unix. Compact, interactive ANSI 74 standard implementation of Cobol.
	£1,109.75	CP/M	●	Level II Cobol	96K		●		●	●			M11	Also on Unix & MS-DOS. High level ANSI 74. Compiler, mainframe-compat code.
	£396.00	CP/M		Fortran 80	48K		●			●			T2	Useful for scientific applications, where Pascal is inefficient.
	£285.20	CP/M	●	Pascal — MT+	64K		●			●			X1	ANSI standard Pascal for Z80 processors. Also on CP/M 86 (£484-90).
	£210	CP/M	●	Supersoft C Compiler	48K		●		●	●			M4	Also on CP/M-86, MS/DOS, PC. DOS. Fast implementation of C.
	£114.43	Commodore 64	●	DTL-Basic Compiler	32K		●		●				D1	Also on Commodore 8000, 4000 & 3000. Also tape version on CBM 64 (£39.96).
	£16.85	BBC Model A	●	Lisp on the BBC	16K	●			●				W1	Also on BBC Model B. Book available £7.50. Lisp is artifical intelligence language.
	£253.00	CP/M	●	ProPascal	56K		●		●	●			E1	Also on CDOS. Needs two disk drives. Native code Pascal.
	£40.19	Sharp MZ80A	●	Forth	48K	●			●				K1	Also on MZ80K & Osborne. Allows implementation of Forth.
	£25	Spectrum		Hisoft Pascal	48K	●							H5	Reviewed in *PCN* week ending April 8. Pascal compiler and screen editor.
	£421.70	Any 8 or 16 bit machine		PL/1	48K		●			●			D4	A compact implementation based on ANSI standard general purpose subset of PL/1.
	£350.75	IBM PC	●	Lattice-C	64K		●		●	●			L1	Also on MS/DOS. C' Compiler for 16 bit machines — full implementation & execution
	£172.50	UCSD p-System		UCSD Pascal	48K		●		●	●			D4	Portable Pascal for systems development or commercial applications.
Linker	£224.25	CP/M		Plink 2	48K		●		●	●			L1	Up to 8 megabytes.
Operations	£59.80	CP/M		Operating Guide	48K		●		●	●			E1	Works by putting CP/M to sleep & replacing it with operating environment.
Operating system	£22.94	Apple II		Fasdos	48K	●			●				P4	Disk operating system for Apples which speeds up location of binary & Applesoft files.
	£277	8086 micro		Concurrent CP/M-86	48K		●			●			T2	Enables four separate tasks to run in a single user station.
	£431.25	Many processors		UCSD p-System	48K		●		●	●			D4	Portable user-friendly operating system including one compiler.
	£295.20	8080 and Z80 micros		CP/M+	128K		●			●			D4	Upward compatible from CP/M enhanced 8-bit micro. O/S.
	£126.50	8080 and Z80 micros		CP/M 2.2	64K		●			●			D4	O/S for 8-bit micros with over 1.5 million users.
	£379.50	8080 and Z80 micros		MP/M	64K		●			●			D4	Multiuser, multitasking. Features record & file locking, date & time stamping etc.
	£210.80	8086 and 8088 micros		CP/M-86	64K		●			●			D4	Manages up to one megabyte of RAM & allows up to 128 megabytes of on-line storage
	£548.20	8086 and 8088 micros		MP/M-86	64K		●			●			D4	Multi-user. Multi-tasking. Multi-user capability with multi-programming for each user
	£168.70	8080, Z80, 8086 and 8088 micros		CP/Net	64K		●			●			D4	A CP/M compatible O/S designed to access local & networked resources.
	£295.20	Motorola MC68000		CP/M 68K	64K		●			●			D4	Extends CP/M to Motorola MC6800/microprocessors. Single user, single tasking.
Program Generator	£228.85	Apple II	●	Quickcode	64K		●		●	●			P4	Also on IBM PC. Program generator for dBase II.
	£126.50	CP/M	●	Forms-2	64K		●		●	●			M11	Also for Unix & MS-DOS. Programming tool, for generating Cobol code.
	£379.50	CP/M	●	Last One	64K		●		●	●			S3	Also on MS-DOS and Apple DOS.
Programming Tool	£2,500	Apple II	●	Pascal Isam/Pascal Form	48K		●		●	●			A4	Also on IBM PC & Corvus Concept. Needs Corvus hard disk. Pascal prog tool.
	£287.50	CP/M	●	Fileshare	48K		●		●	●			M11	Also on MP/M. Bank-switched memory or CP/M network.
	£7.95	Dragon 32		Dragon Selection 2	32K	●							D3	Four utility programs which can be listed to see how the program works.
Telex	£2,113.70	Superbrain	●	Micro Telex	64K		●		●	●			E1	Also on Televideo 802. Enables automatic sending-receiving or telex by micro.
Testing Tool	£95.82	CP/M 80	●	Diagnostics II	32K		●		●	●			M4	Also on CP/M-86 and MS/DOS. Tests systems.
Time Recording	£862.50	Commodore 8000	●	Minuteman	32K		●			●			C4	Also on Commodore 4000. Time recording system. Can produce range or reports.
	£402.50	CP/M-86	●	Time Recording System	64K		●		●	●			D2	Also on CP/M 80. Control over man/hour expenditure by job or account number.
Utilities	£23.00	Apple II	●	Computech Utilities Disk II	48K		●		●	●			C1	Also on Apple IIe. Error checking, copying. Single disk copy. Label disk.
	£115.00	IBM PC		C-Food Smorgasbord	64K		●		●	●			L1	Decimal arithmetic, low level & terminal independent input & output.
	£79.35	CP/M		Visa 80	64K		●		●	●		●	M13	Constructs a menu-driven system to your design.

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QUIT

SYNTAX ERRORS

Snail score

The performance rating in our Pro-Test of Snail Logo in last week's issue took an unwarranted dive when its score dropped off the page before printing. It scored two.

Upgrade upbraid

In the Commodore 64 Micropaedia, the Commodore IEEE interface was quoted as being cheaper than the DAMS interface. But, in fact, the DAMS interface costs £59.95 and Commodore's cost £80. The £39.95 quoted erroneously refers to Commodore's RS232 interface for the machine.

Signal error

Two clarifications, too, in our Dragon Micropaedia. In our exploded view of the Dragon board we gave the impression that the machine could run true RGB colour through the RGB socket, but in fact, it runs simple composite RGB with sound. Also on page 219, at the end of line 10 in our Morse code program the statement A=ACS (A$) should read A=ASC (A$).

On the Levell

Events overtook a Barnet company in spectacular style this week. In the week that saw Osborne sinking in the west, a firm circulated a press release proclaiming that it has been appointed as main dealers for the ill-fated portable.

'The go-ahead Osborne Computer Corporation,' the letter from Levell Electronics starts, and continues in glowing prose about Osborne, the man, the machine and the company.

The best is at the end. 'Reliability is a key factor when you have a computer and Levell Electronics chose to market Osborne Computers only after they assured themselves that these products were reliable,' says Levell.

Ah well. Nice machine, shame about the company.

NEXT WEEK

Micropaedia Special **— Start collecting a magnificent eight-part pull-out on everything about programming.**
Hardware **— NEC muscles in on the market with APC.**
Peripherals **— Thrills and spills as *PCN* reviews the Micronet modem.**
Software **— We look at Financial Planner for the IBM PC.**
Gameplay **— Test runs of games for the Dragon, BBC, Spectrum and Commodore 64.**

Distaff data

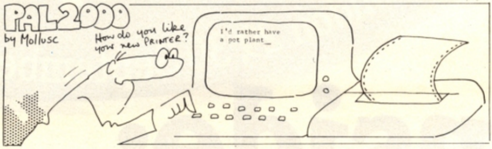
Acorn has discovered that women are falling behind in the race to computer literacy. Ignoring one possible explanation — that women are waiting for Acorn's second processor on the BBC — the company has set about rectifying this.

But here it is, from the horses's mouth.

Chris Curry speaks, and the flower of the UK's womanhood holds it breath: 'We are attempting to do something about this problem by aiming our products as much at women as at men.

Acorn says that its attempts take the form of producing software that 'is more relevant and more useful to women'. It cites a gardening program that is almost three months old, and apparently this is the only example it can produce at the moment.

But programs on raffia work, jam-making and meals on wheels are sure to come sooner or later.



PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
Second National British Osborne Owners' Group Meeting	September 17	National Liberal Club, 1 Whitehall Place, London SW1	Dr J. Anglesea, 021-472 1311 Ext 275
Home Entertainment Show	September 17-25	Olympia, London	Montbuild Ltd, 01-486 1951
Kent Apple Village	September 18-21	Stour Centre, Ashford, Kent	Database Publications, 061-456 8383
Computer Open Day Exhibition	September 22	Central Hotel, Glasgow	Couchmead Communications Ltd, 01-778 1102
Microcomputers in Business	September 27-29	Warwick University, Coventry	Peter Bubb, 01-892 4422
IWP one-day workshop	September 29	City Conference Centre, 76 Mark Lane, London EC3	Quadrilect, 3 Courtfield House, Baldwin Gardens, London EC1, 01-242 8697
Personal Computer World Show	September 29-October 2	Barbican Centre, London	Montbuild Ltd, 01-486 1951
Computer Fair	October 2	The Sir Frederic Osborn School, Welwyn Garden City	R Brown Welwyn Garden City 23367
Lancaster & Morecambe Computer Club Open Day	October 29	Lower Town Hall, Lancaster	Brian Sheldon, 0524 61831
Software Expo	November 8-10	Wembley Conference Centre, London	Interco, 01-948 3111

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Sicob '83	September 21-30	Paris, France	French Trade Exhibition, 01-439 3964
Info '83	October 10-13	New York, USA	Cahners Exposition Group, 0483 38085
Computer Systems International Trade Fair & Congress	October 17-21	Munich, West Germany	ECL Exhibition Agencies, 01-486 1951



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